APPENDIX C: Description of Oregon's Sensitive Species

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PLANTS

Applegate's Milk-Vetch

A member of the pea family (Fabaceae), Applegate's milk-vetch (*Astragalus applegateii*) is a slender, herbaceous perennial, often decumbent (lies flat on the ground), with stems to sixteen inches long, which have seven to eleven narrow, slightly strigose leaflets. The flowers, whitish to lilac in color, are small with petals only one-fourth of an inch long. The seed pods, up to one-half of an inch long, are faintly mottled. Applegate's milk-vetch blooms and produces seed pods from June to early August. It is distinguished from other sympatric *Astragalus* species by its slightly curved stems, the number and location of the flowers, and its apparent inability to colonize dry, disturbed areas (USDI 1993a).

Applegate's milk-vetch was discovered near Klamath Falls, Oregon in 1927, and is known to exist only in one or two sites in Klamath County in southern Oregon. The site of only population with more than 10 individuals is in an expanding industrial area of Klamath Falls.

Applegate's milk-vetch grows in flat, open, seasonally moist remnants of flood plain alkaline grassland of the Klamath Basin. The substrate is poorly drained, fine silt loam, with an underlying hardpan 10 to 20 inches below. The species may be adversely affected by lack of seasonal flooding, which may formerly have been instrumental in reducing competition and providing openings for colonization. Irrigation withdrawals and water control structures along the Klamath River have eliminated the area's natural flooding regimes. The "large" population of this species, comprising about 1000 plants on 6 acres, has been impacted by road construction; the area it occupies is zoned for commercial or industrial use. Applegate's milk-vetch was listed as federally endangered on July 28, 1993 (USDI 1993a).

In order to minimize damage to Applegate's milk-vetch or its habitat, the Project Design Criteria (PDCs) listed in Appendix D will be followed.

Bradshaw's Lomatium

Bradshaw's lomatium (*Lomatium bradshawii*), a member of the carrot family (Apiaceae), grows from eight to twenty inches tall, with mature plants having only two to six leaves. Leaves are chiefly basal and are divided into very fine, almost threadlike, linear segments. The yellow flowers are small, measuring about 1 mm long and 0.5 mm across, and are grouped into asymmetrical umbels. Each umbel is composed of 5 to 14 umbellets, which are subtended by green bracts divided into three's. This bract arrangement differentiates *L. bradshawii* from other lomatiums. Bradshaw's lomatium blooms during April and early May, with fruits appearing in late May and June. Fruits are oblong, about one-half inch long, corky and thick-winged along the margin, and have thread-like ribs on the dorsal surface. This plant reproduces entirely from seed.

The majority of Bradshaw's lomatium populations occur on seasonally saturated or flooded prairies, adjacent to creeks and small rivers in the southern Willamette Valley. Soils at these sites are dense, heavy clays, with a slowly permeable clay layer located 15 to 30 cm below the surface. This clay layer results in a perched water table during winter and spring, and so is critical to the wetland character of these grasslands, known as tufted hair-grass (*Deschampsia*) prairies. Insects observed to pollinate this plant include a number of beetles, ants, and some small native bees.

Endemic to and once widespread in the wet, open areas of the Willamette Valley of western Oregon, Bradshaw's lomatium is limited now to a few sites in Lane, Marion, and Benton Counties. The greatest concentrations of remaining sites and plants occur in and adjacent to the Eugene metropolitan area. Most of its habitat has been destroyed by land development for agriculture, industry, and housing. In addition, water diversions and flood control structures have changed historic flooding patterns, which may be critical to seedling establishment. Reductions in natural flooding cycles also permit invasion of trees and shrubs, and eventual conversion of wet prairies to woodlands. Bradshaw's lomatium was listed as federally endangered on September 30, 1988 (USDI 1988).

To eliminate or reduce adverse project impacts to Bradshaw's lomatium, the PDCs listed in Appendix D will be followed.

Cook's Lomatium

Cook's Lomatium (*Lomatium cookii*) is a perennial herb that grows to a height of 8 to 15 inches, from a slender, twisted taproot. The species grows in vernal pools or other seasonally wet habitats, on soils that have a shallow hard or clay pan layer that maintains seasonally wet soils at the surface. The species is known from 4 remnant populations, in total occupying some 60 ha (150 ac). The plants occur in two disjunct clusters in southwestern Oregon: the Illinois Valley (Josephine County) and the Agate Desert (Jackson County).

Because Cook's lomatium was first collected only in 1981, estimates of historic population size are difficult. However, based on known historic distribution of vernal pools in the area, it may be that over 99 percent of the species' habitat has been lost (J. Kagan, pers. comm., 1997). The Nature Conservancy (TNC) owns and actively manages two sites in the Agate Desert, the Agate Desert Preserve (approximately 12.5 acres of habitat) and the recently acquired Whetstone Savannah Preserve (about 1.2 acres of habitat).

Cook's lomatium is imminently threatened by habitat destruction, primarily from residential and industrial development, including road and powerline construction. Within the past 10 years, numerous populations have been bisected by roads and powerlines and sewer lines, lost to department store and sports park complex and residential construction. Other factors contributing to habitat loss include off-road vehicle use, gold mining, and overgrazing.

Development in southwestern Oregon is escalating. Since the listing package was submitted, a large population [500 plants] in the Illinois Valley (Josephine County) was destroyed by a housing development during the summer of 1996. Additionally, one of three subpopulations north of Rough and Ready Creek in Josephine County (containing 250 plants) was lost to agriculture. Currently, the most serious threat is a proposed state prison for the City of Medford, to be sited within one of the largest population cluster adjacent to TNC's preserve for this species (D. Borgias, pers. comm., 1997).

The only Cook's lomatium site on federal land is located near French Flat and managed by the Bureau of Land Management (BLM). Gold mining operations threaten some 600 plants on BLM land. Mining activities could result in direct habitat loss, or could alter hydrologic regimes upon which the species depends.

With many plants, in cases of inevitable habitat loss, transplantation may be an option of last resort in preserving individuals and maintaining genetic diversity. However, transplantation does not appear to be feasible for Cook's lomatium. The plant's twisted taproot is so horizontally extensive above the pan layer and the root hairs so interwoven with the rocky substrate that a tremendous amount of material would have to be moved with the plant to avoid root injury and subsequent mortality. Where transplantation has been attempted, the plants have died (D. Borgias, pers comm., 1997).

In order to minimize damage to Cook's lomatium or its habitat, the PDCs listed in Appendix D will be followed.

Gentner's Fritillary

A member of the Lily family (Family: Liliaceae), Gentner's fritillary (*Fritillaria gentneri*) flowers from April to June, producing striking racemes of reddish-purple flowers, with yellow streaks. This species occurs in rather dry, open woods of fir and oak, at low elevations. It is known only from a few scattered localities along the Rogue and Illinois River drainages, in Jackson and Josephine Counties, and is proposed for listing as an endangered species (USDI 1998a).

Prized by collectors, this rare lily is threatened by over-collection, especially as some populations are located adjacent to well-traveled roadways. Grazing and logging are also potential threats. In order to minimize damage to Gentner's lily or its habitat, the PDCs listed in Appendix D will be followed.

Howell's Spectacular Thelypody

The following information on Howell's spectacular thelypody (*Thelypodium howellii* ssp. *spectabilis*) is from Meinke (1982) and USDI (1998b). Howell's spectacular thelypody is a

biennial plant (Family: Brassicaceae) that grows to approximately 60 cm tall, with branches arising from near the base. Basal leaves are oblanceolate to spatulate and 2-10 cm long. Cauline leaves (leaves borne on stem) are lanceolate to linear lanceolate, entire, and usually sagittate (arrowhead-shaped) at the base (1-10 cm long). Flowering typically takes place from June through July. Sepals are erect, scarious at the margin, and green, purple or lavender in color. The four petals per flower are mostly spatulate, occasionally oblanceolate, and lavender to purple in color. Its petal shape and paired free filaments distinguish *T. howellii* ssp. *spectabilis* from *T. howellii* ssp. *howellii*.

This plant occurs in moist, moderately well-drained, somewhat alkaline meadow habitats, typically growing with salt tolerant species such as *Sarcobatus vermiculatus* (greasewood), *Elymus cinereus* (giant wild rye), and *Chenopodium* spp. (goosefoot). *Thelypodium howellii* ssp. *spectabilis* appears dependent on periodic flooding because it rapidly colonizes areas adjacent to streams that have flooded. It is known from 18 extant sites in the Baker-Powder River Valley located near the communities of North Powder, Haines, and Baker in Union and Baker Counties. The plant has been extirpated from about one-third of the historic sites, including the type locality in Malheur County, and is proposed for listing as a threatened species (USDI 1998b).

Threats to the taxon include 1) habitat loss due to modification or loss to urban and agricultural development; 2) habitat degradation due to livestock grazing and hydrological modification; 3) consumption by livestock; 4) use of herbicides or mowing during the growing season; and 5) competition with exotic species such as *Dipsacus sylvestris* (teasel), *Cirsium vulgare* (bull thistle), *C. canadensis* (Canada thistle), and *Melilotus officinalis* (yellow sweet clover).

To eliminate or reduce adverse Partners program project impacts to *Thelypodium howellii* ssp. *spectabilis*, the PDCs listed in Appendix D will be followed.

Kincaid's Lupine

Kincaid's lupine (*Lupinus sulphureus* ssp. *kincaidii*) occupies 51 sites throughout the Willamette Valley and one site in southern Washington, which implies a close association with native upland prairie sites. Its aromatic flowers are yellowish-cream colored, often showing shades of blue on the keel. The upper calyx (collective sepals) lip is short, yet unobscured by the reflexed banner when viewed from above. The leaflets tend to a deep green with an upper surface that is often glabrous. The plants are 4-8 decimeters (~16-32 inches) tall, with single to multiple unbranched flowering stems and basal leaves that remain after flowering (Kuykendall and Kaye 1993). Kincaid's lupine is a long-lived perennial species, with a maximum reported age of 25 years (M. Wilson, Oregon State University, in litt., 1993), and is pollinated by solitary bees and flies (P. Hammond, pers. comm., 1994). Seed set and seed production are low, with few (but variable) numbers of flowers producing fruit from year to year (Liston *et al*. 1994). Seeds are dispersed from fruits that open explosively upon drying.

The primary loss of habitat for *Lupinus sulphureus* ssp. *kincaidii* has resulted from the extensive

alteration of native prairie in the Willamette Valley that has occurred over the last 140 years. Over 99 percent of the native prairie in the Willamette Valley, the only known habitat area of Kincaid's lupine, has been lost (E. Alverson, pers. comm., 1994). Habitat at 80 percent of the sites containing Kincaid's lupine (e.g., 68) is rapidly disappearing due to agriculture practices, development activities, forestry practices, grazing, roadside maintenance, and commercial Christmas tree farms. Because of these threats the Service proposed listing Kincaid's lupine as a threatened species in 1998 (USDI 1998c).

In order to avoid impacts to Kincaid's lupine, Partners program projects will follow the PDCs outlined in appendix D. For more detailed information on this species, see the Proposed Rule for Kincaid's lupine (USDI 1998c).

Large-flowered Wooly Meadowfoam

A delicate annual in the meadowfoam, or false mermaid, family (Limnanthaceae), the large-flowered wooly meadowfoam (*Limnanthes floccosa* ssp. *grandiflora*) grows 5 to 15 cm (2 to 6 in) tall, with 5 cm (2-in) leaves divided into 5 to 9 segments. The stems and leaves are sparsely covered with short, fuzzy hairs, while the flowers and, especially, the calyx are densely covered with wooly hairs. Each of the five yellowish to white petals is 5 to 10 mm (1/4 to 1/2 in) and has two rows of hairs near its base.

The large-flowered wooly meadowfoam occurs in and around vernal pools within an 83 square km (32 square mi) landform in southwestern Oregon (Jackson County) known as the Agate Desert; which is also one of the sites where Cook's lomation is found. Located on the floor of the Rogue River basin north of Medford, the Agate Desert is characterized by shallow, Agate-Winlow complex soils, a relative lack of trees, and sparse prairie vegetation (ONHP 1997). The Agate-Winlow soil landscape consists of a gentle mound-swale topography that develops pools of water in the swales during the fall and winter rainy season. These vernal pools vary in size from 1 to 30 meters (m) (3 to 100 feet) across, and attain a maximum depth of about 30 cm (12 in) (ONHP 1997). Plants native to these pools are adapted to grow, flower, and set seed during the relatively short time that water is available in the spring.

There are only 10 known occurrences of large-flowered wooly meadowfoam in the Agate Desert where mapped habitat for this species totals 198 acres (ONHP 1998). However, due to recent alteration and destruction of Agate Desert vernal pools (ONHP 1997), habitat currently occupied by large-flowered wooly meadowfoam is considerably less, at an estimated 116 acres (ONHP 1998). Vernal pool habitat, formerly widespread south of the Rogue River, is now almost completely eliminated (Brock 1987; ONHP 1997).

Five occurrences of *Limnanthes floccosa* ssp. *grandiflora* are located on other non-federal lands. Two occurrences are on State land, primarily the Ken Denman Wildlife Area, where much of the habitat has been altered and planted to grasses. Portions of three occurrences are on lands owned by the City of Medford, within an area designated as the Whetstone Industrial Park, while

portions of two occurrences are located in State or county-maintained highway rights-of-way, or in powerline rights-of-way (ONHP 1998), where they are subject to herbicide spraying and other maintenance activities.

The continued existence of the large-flowered wooly meadowfoam is at risk, primarily by destruction of their specialized habitat by industrial and residential development, including road and powerline construction and maintenance. Agricultural conversion, certain grazing practices, off-road vehicle use, and competition with non-native plants also contribute to population declines. The Service designated the large-flowered wooly meadowfoam as a candidate species on December 15, 1980 (USDI 1980a).

MacFarlane's Four-o'clock

The following information on MacFarlane's four-o'clock (*Mirabilis macfarlanei*) (Family: nyctaginaceae) is from the species recovery plan (USDI 1985a). MacFarlane's four-o'clock is an endangered perennial with freely branched stems (swollen at the nodes), so that the plant forms hemispherical clumps 6-12 decimeters in diameter. The leaves are opposite, somewhat succulent, green above and glaucescent (film covered) below. The lower leaves are orbicular or ovate-deltoid in shape and become progressively smaller toward the tip of the stem. Flowers bloom between May and early June with an inflorescence that is a 4-7 flowered cluster subtended by an involucre. The flowers are striking in their large size (up to 25 mm long and 25 mm wide) and rose-purple color. They are funnel-form in shape with a widely expanding limb. The flower is 5-merous, stamens 5, generally exerted. The root is a stout, deep-seated taproot.

MacFarlane's four-o'clock has been found in 25 sites: eleven sites on the banks of the Snake River in Hell's Canyon, Wallowa County, Oregon and Idaho County, Idaho; two sites above the Imnaha River, Wallowa County, Oregon: and 12 sites above the Salmon River in adjacent Idaho County, Idaho.

All of the populations of MacFarlane's four-o'clock known at this time grow as scattered plants on open, steep (50%) slopes of sandy soils, generally having west to southwest aspects. One colony has been found having an east aspect. Talus rock underlies the soil in which the plants are rooted. The soil type is unknown. The plant community is a transition between *Agropyron spicatum - Poa secunda* (bluebunch wheatgrass - Sandberg's bluegrass) and *Rhus glabra - Agropyron spicatum* (smooth sumac - bluebunch wheatgrass). The native *Poa secunda* of this community has been replaced by the exotic *Bromous tectorum* (cheatgrass).

The plant is vulnerable to trampling due to increased recreational use of a hiking trail (along the Snake River in OR); collection of plants; grazing pressure (cattle trampling resulting in soil erosion); inhibitory effects on seed germination, growth and development by exotic plants (cheatgrass); fungal disease (two species of fungi); ovary predation by a lepidopteran; and damage by spittle bugs. This species was listed as Threatened by the Service in 1979 (USDI 1979.)

Recovery actions for MacFarlane's four-o'clock include conducting censuses, securing each colony with habitat management plans, establishing new colonies at suitable sites, and establishing propagule banks.

To eliminate or reduce adverse project impacts to MacFarlane's four-o'clock, the PDCs listed in Appendix D will be followed.

McDonald's Rock-cress

McDonald's rock-cress (*Arabis mcdonaldiana*) is a perennial member of the mustard family (Brassicaceae) and can be distinguished by its relatively large, conspicuous lavender to purplish flowers, flattened rosette, glabrous simple leaves, and seeds with wings on the distal end. McDonald's rock-cress is restricted to soils derived from ultramafic rocks, commonly referred to as serpentine. McDonald's rock-cress is commonly found in open areas around manzanita in open canopied mixed conifer forest with various mixes of ponderosa pine, Jeffrey pine, sugar pine and incense cedar. McDonald's rock-cress is known from Mendicino County, California, and, recently, from Josephine and Curry Counties, Oregon.

McDonald's rock-cress is a poor competitor for the scant resources of serpentine soils, and is restricted in distribution for this reason. The recovery plan for this species (USFWS 1990a) cites mining and road widening/maintenance as the two main threats to this specie's survival, which is why the Service listed this plant as endangered in 1978 (USDI 1978). At that time the Josephine County population was unknown. This population, however, is also threatened by a proposed nickel mine. While all the known populations of McDonald's rock-cress in Oregon are on federal land, it may occur on private land, as well (J. Kagan, pers. comm., 1998).

To prevent any adverse impact to McDonald's rock-cress, any projects in serpentine soils in Southwestern Oregon will be surveyed prior to implementation of Partner's activities, and the PDCs in Appendix D will be followed.

Nelson's Checkermallow

Nelson's checkermallow (*Sidalcea nelsoniana*) in the mallow family (Malvaceae), is a perennial herb with pinkish-lavender to pinkish-purple flowers born in clusters at the end of 1 to 2.5 foot tall stems. The majority of sites for the species occur in the Willamette Valley of Oregon; the plant is also found at several sites in the Coast Range of Oregon and at one site in the Coast Range in Cowlitz County, Washington. Thus the range of the plant extends from southern Benton County, Oregon, north to Cowlitz County, Washington, and from central Linn County, Oregon, west to just west of the crest of the Coast Range.

Inflorescences of plants from the Willamette Valley are usually somewhat spike-like, usually elongate and somewhat open (Hitchcock 1957). Inflorescences of plants from the Coast Range

are shorter and not as open (K. Chambers, pers. comm.). Plants have either perfect flowers (male and female) or pistillate flowers (female). The plant can reproduce vegetatively, by rhizomes, and produces seeds that drop near the parent plant. Flowering can occur as early as mid-May and extend into September in the Willamette Valley. Fruits have been observed as early as mid-June and as late as mid-October. Coast Range populations generally flower later and produce seed earlier, probably because of the shorter growing season (CH_2M Hill 1991).
Within the Willamette Valley, Nelson's checkermallow most frequently occurs in *Fraxinus* (ash) swales and meadows with wet depressions, or along streams. The species also grows in wetlands within remnant prairie grasslands. Some sites occur along roadsides at stream crossings where exotics such as blackberry (*Rubus* spp.) and Queen Anne's lace (*Daucus carota)* are also present. Nelson's checkermallow primarily occurs in open areas with little or no shade and will not tolerate encroachment of woody species.

Prior to European colonization of the Willamette Valley, naturally occurring fires and fires set by Native Americans maintained suitable Nelson's checkermallow habitat. Current fire control and prevention practices allow succession of introduced and native species, which may gradually replace habitat for Nelson's checkermallow (BLM 1985). Any remnant prairies in the Willamette Valley have been modified by livestock grazing, fire suppression, or agricultural land conversion. (Moir and Mika 1972). Stream channel alterations, such as straightening, splash dams, and rip-rapping cause accelerated drainage and reduce the amount of water that is diverted naturally into adjacent meadow areas. As a result, areas that would support Nelson's checkermallow are lost. The species is now known to occur in 48 patches within five relict population centers in Oregon, and at one site in Washington (CH_2M Hill 1991). Four additional sites with occurrences recorded since 1985 apparently have been extirpated as a result of plowing, deposition of fill material or yard debris, or intense roadside vegetation management. Nelson's checkermallow was listed as threatened on February 12, 1993 (USDI 1993b).

In order to minimize damage to Nelson's checkermallow or its habitat, the PDCs listed in Appendix D will be followed.

Rough Popcornflower

An annual herb in the Borage family (Boraginaceae), the rough popcornflower (*Plagiobothrys hirtus*) is an annual herb with a stout stem, erect or reclining, that grows 1 to 2 feet long. The leaves are linear, the lower paired and the upper alternate, 10 to 25 cm in length. The flowers are white with yellow centers, 5-petaled, radially symmetrical, up to 20 mm across, and are arranged in curled racemes typical of the borage family. The nutlets (seeds) are ovate, 2 mm long, with a prominent dorsal keel. It can be distinguished from other sympatric *Plagiobothrys* species by its distinctive, wide-spreading hairs, in contrast to the appressed hairs of the other species. The species is an annual, or creeping perennial with rooting stems, a unique trait for the genus.

The rough popcornflower has a narrow range historically, and currently occurs at only 4 known sites in Oregon's Umpqua Valley, near Sutherlin, in Douglas County. The sites are all located

within 5 miles of one another and total under 10 acres in area. Fewer than 3,000 plants exist. The species occurs in moist, open areas on poorly drained silty clay soils in flat valley bottoms. Its habitat is maintained by the seasonal ponding of water.

The rough popcornflower is highly threatened by development, ditching, road building and maintenance, grazing, and competition with non-native weeds. One population actually occurs within the town of Sutherlin, on a vacant lot surrounded by residential areas. Another population occurs along the shoulder of Interstate 5, at the Sutherlin exit. The third population is transversed by a series of drainage ditches, with seasonal pool areas leveled with fill dirt, which has introduced non-native weeds to the site. The fourth site has a history of sheep grazing, and is presently grazed by cattle (Gamon and Kagan 1985). Listing of this species is urgently needed, although some recovery work is already in progress (Amsberry and Meinke 1997).

In order to minimize damage to the rough popcornflower or its habitat, the PDCs listed in Appendix D will be followed.

Umpqua Mariposa Lily

The Umpqua mariposa lily *(Calochortus umpquaensis,* Family: Liliaceae) is a bulbous perennial, with a single, dark green basal leaf 8 to 12 inches long and a flowering stalk 8 to 20 inches high. This stalk bears one to five three-petaled flowers, which measure 1.5 to 3 inches in diameter. Flowers are white, with a deep purple spot near the base of the petal. Blooming occurs in June and July.

The Umpqua mariposa lily occurs in an area of less than 32,000 acres, in Douglas County, Oregon. Within this limited range, the species is restricted to serpentine soils, but does not seem restricted to a particular aspect or slope type. Fourteen populations are presently known extant.

Studies have shown that this lily is significantly affected by grazing, which removes the individual's single leaf. Feeding by deer, rabbits and insects alone can cause serious damage; additional grazing by cattle could readily lead to extirpation of populations (Fredricks *et al*. 1992). Like other members of its genus, this showy lily is also highly sought after in the horticultural trade. In order to minimize damage to the Umpqua mariposa lily or its habitat, the PDCs listed in Appendix D will be followed.

Western Lily

The western lily (*Lilium occidentale*), a perennial in the lily family (Liliaceae), grows from a short unbranched, rhizomatous bulb, reaching a height of up to 1.8 meters (5 ft.). Leaves grow along the unbranched stem singly or in whorls and are long and pointed, roughly 1 cm wide and 10 cm long (0.5 in by 4 in). The nodding flowers are red, sometimes deep orange, with yellow to green centers in the shape of a star and spotted with purple. The six petals are 3 to 4 cm (1 to 1.5 in) long and curve strongly backwards.

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The western lily has an extremely restricted distribution within 2 miles (3.2 kilometers) of the coast, from Hauler, Coos County, Oregon to Lolita, Humboldt County, California. This range encompasses approximately the southern one-third of the Oregon coast and the northern 100 miles (161 km) of the California coast. The plant is currently known from 7 widely separated regions along the coast, and occurs in 31 small, isolated, densely clumped populations. Of the 25 populations known in 1987 and 1988, 9 contained only 2 to 6 plants, 5 contained 10 to 50 plants, 6 contained 51 to 200 plants, 4 contained 201 to 600 plants, and 1 contained almost 1,000 plants (Schultz 1989). At some sites, particularly the sites with more than 200 plants, the majority of plants were non-flowering, which is probably an indication of stress (Schultz 1989). Since then, an estimated total of 1,000 to 2,000 flowering plants have been discovered at 4 sites near Crescent City, California, where none were previously known (Dave Imper, pers. comm., 1991). In addition, a population of about 125 flowering plants was discovered near Brookings, Oregon, in 1991 (Margie Willis, pers. comm., 1991), and a population of 13 flowering plants was discovered near Bandon, Oregon, in 1992.

The western lily grows at the edges of sphagnum bogs and in forest or thicket openings along the margins of ephemeral ponds and small channels. It also grows in coastal prairie and scrub near the ocean where fog is common. Historical records indicate that the western lily was once more common than it is today. After the ice age, rising sea levels flooded marine benches, creating much more extensive bogs and coastal scrub than exist today. That may account for the patchiness of the western lily's current distribution. It is known or assumed to be extirpated in at least nine historical sites, due to forest succession, cranberry farm development, livestock grazing, highway construction, and other development. These factors continue to threaten the lily, with development taking a primary role. Two known populations near Brookings, Oregon were partially or totally destroyed by unpermitted development-related wetland fill activity in 1991. The largest known population and three smaller populations near Crescent City, California are currently threatened by housing and recreation development. The western lily was listed as federally endangered on August 17, 1994 (USDI 1994a).

In order to minimize damage to the western lily or its habitat, the PDCs listed in Appendix D will be followed.

Willamette Daisy

A member of the sunflower family (Asteraceae), this plant is a perennial herb, 6-24 inches tall. Basal leaves are 2 to 7 inches long and less than ½ inch wide, becoming gradually shorter along the stem. The flowering stems, which are taller than the vegetative stems, produce 2 to 5 flower heads in June and July. The flowers are daisy-like, with yellow centers and 25 to 50 pinkish to blue rays, often fading to white with age.

The Willamette daisy *(Erigeron decumbens* var. *decumbens*) is endemic to the state of Oregon, where it is known only from the Willamette Valley. Historically, this plant likely was widespread throughout the Valley. Presently, 18 sites are known, distributed over an area of

some 1.7 million acres, between Grand Ronde and Goshen, Oregon. The plant is known to have been extirpated from an additional 19 historic locations (Clark *et al*. 1993).

Willamette daisy populations are known from both bottomland and upland prairie remnants. Prior to European settlement, these prairies were maintained by fire, which prevented the establishment of woody species. Prairie remnants are considered to be among the rarest habitats in western Oregon and are threatened by fragmentation, agriculture and urban growth. Most sites are small and privately owned. Only four sites are in secure ownership (Clark *et al*. 1993). In order to avoid impacts, restoration activities will incorporate the PDCs listed in Appendix D.

FISH

Borax Lake Chub

The borax lake chub (*Gila boraxobius*) is endemic to the 640 acres of Borax Lake, and has been found in lower Borax Lake and their associated wetlands in Harney County, in south-central Oregon. This small (up to 93 mm, 3.6 in) chub is restricted to the geothermally heated Borax Lake system which reaches temperatures, typically, of between 35 and 40°C (95 to 104°F) at the inflow. The lake system also has a water chemistry that makes it an unusual habitat within the surrounding desert landscape. Water diversions for agricultural purposes have, in the past, been a danger to this species, but the 1993 purchase of the lake by The Nature Conservancy has put an end to that threat. The Borax Lake Chub remains listed as endangered, however, due to potential geothermal energy exploration on BLM lands within two miles of the lake. Heavy recreational use is also considered a threat to the species.

Population counts conducted in 1995 and 1997 estimated that there were 34,634 and 10,631 individuals, respectively, which represents a 69 percent fluctuation (Dan Salzer, pers. comm., 1998). Borax Lake Chub reproduce year-round, although primarily in the spring (Williams 1995). Insects comprise the chub's diet in the spring and summer while allochthonous material is the primary diet item in the fall and winter (USDI 1995b). While Borax lake chub are adapted to the warm water of Borax Lake, temperature fluctuations impact where the fish can be found within the lake (Williams *et al.* 1989).

No Partners program projects will be initiated within the sub-basin that drains into Borax Lake which involve the use of pesticides or other chemicals, or which involve the diversion of water, without further consultation.

Bull Trout

The bull trout (*Salvelinus confluentus*) was first described by Girard in 1856 from a specimen collected on the lower Columbia River. Cavender (1978) presented morphometric, meristic, osteological, and distributional evidence to document the separation between Dolly Varden (*Salvelinus malma*) and bull trout, and resurrected the species name *confluentus*, as first

proposed by Suckley in 1858. Based on this work, taxonomists have recognized bull trout as a separate species from the coastal Dolly Varden since 1978 (Bond 1992).

Juvenile bull trout average approximately 50 to 70 mm (2 to 3 in) in length at age 1, 100 to 120 mm (4 to 5 in) at age 2, and 150 to 170 mm (6 to 7 in) at age 3 (Pratt 1992). Juveniles have a slender body form and exhibit the small scalation typical of charr. The back and upper sides are typically olive-green to brown with a white to dusky underside. The dorsal surface and sides are marked with faint pink spots. They lack the worm-like vermiculations and reddish fins commonly seen on brook trout (*Salvelinus fontinalis*). Spawning bull trout, especially males, turn bright red on the ventral surface with a dark olive-brown back and black markings on the head and jaw. The spots become a more vivid orange-red and the pectoral, pelvic, and anal fins are red-black with a white leading edge. The males develop a pronounced hook on the lower jaw. Bull trout have an obvious "notch" on the end of the nose above the tip of the lower jaw.

Bull trout populations are known to exhibit four distinct life history forms: resident, fluvial, adfluvial, and anadromous. Resident bull trout spend their entire life cycle in the same (or nearby) streams in which they were hatched. Fluvial and adfluvial populations spawn in tributary streams where the young rear from one to four years before migrating to either a lake (adfluvial) or a river (fluvial) where they grow to maturity (Fraley and Shepard 1989). Anadromous fish spawn in tributary streams, with major growth and maturation occurring in salt water.

The historic range of the bull trout spanned seven states (Alaska, Montana, Idaho, Washington, Oregon, Nevada, and California) and two Canadian Provinces (British Columbia and Alberta) along the Rocky Mountain and Cascade Mountain ranges (Cavender 1978). In the United States, bull trout occur in rivers and tributaries throughout the Columbia Basin in Montana, Idaho, Washington, Oregon, and Nevada, as well as the Klamath Basin in Oregon, and several cross-boundary drainages in extreme southeast Alaska. In California, bull trout were historically found in only the McCloud River, which represented the southernmost extension of the species' range. Bull trout numbers steadily declined after completion of McCloud and Shasta Dams (Rode 1990). The last confirmed report of a bull trout in the McCloud River was in 1975, and the original population is now considered to be extirpated (Rode 1990).

Bull trout distribution has been reduced by an estimated 40 to 60 percent since pre-settlement times, due primarily to local extirpations, habitat degradation, and isolating factors. The remaining distribution of bull trout is highly fragmented. Resident bull trout presently exist as isolated remnant populations in the headwaters of rivers that once supported larger, more fecund migratory forms. These remnant populations have a low likelihood of persistence (Reiman and McIntyre 1993). Many populations and life history forms of bull trout have been extirpated entirely.

Highly migratory, fluvial populations have been eliminated from the largest, most productive river systems across the range. Stream habitat alterations restricting or eliminating bull trout

include obstructions to migration, degradation of water quality, especially increasing temperatures and increased amounts of fines, alteration of natural stream flow patterns, and structural modification of stream habitat (such as channelization or removal of cover).

In Oregon, bull trout were historically found in the Willamette River and major tributaries on the west side of the Oregon Cascades, the Columbia and Snake rivers and major tributaries east of the Cascades, and in streams of the Klamath Basin (Goetz 1989). Presently, most bull trout populations are confined to headwater areas of tributaries to the Columbia, Snake, and Klamath rivers (Ratliff and Howell 1992). Major tributary basins containing bull trout populations include the Willamette, Hood, Deschutes, John Day, and Umatilla (Columbia River tributaries), and the Owyhee/Malheur, Burnt/Powder, and Grande Ronde/Imnaha Basins (Snake River tributaries). Of these eight major basins, large fluvial migratory bull trout are potentially stable in only one, the Grande Ronde, and virtually eliminated from the remaining 7, including the majority of the mainstem Columbia River. The only known increasing population of bull trout is an adfluvial migrant population located in Lake Billy Chinook, and spawning and rearing in the Metolius River and tributaries. In recognition of the precarious status of Oregon bull trout populations, harvest of bull trout is prohibited in all state waters with the exception of Lake Billy Chinook and Lake Sintustus in the Deschutes River Basin.

Columbia and Klamath River basin bull trout have been isolated from one another for over 10,000 years. Leary *et al*. (1993) demonstrated substantial genetic separation between bull trout in the Klamath and Columbia River basins; these two basin populations would constitute "distinct population segments," potentially listable under the Endangered Species Act.

Bull trout spawn in the fall, primarily in September or October when water temperatures drop below 9°C (48°F). Typically, spawning occurs in gravel, in runs or tails of spring-fed pools. Adults hold in areas of deep pools and cover and migrate at night (Pratt 1992). After spawning, adfluvial adults return to the lower river and lake. In Flathead Lake, Montana, an average of 57 percent of the adult bull trout spawned in a given year (Fraley and Shepard 1989).

Bull trout eggs are known to require very cold incubation temperatures for normal embryonic development (McPhail and Murray 1979). In natural conditions, hatching usually takes 100 to 145 days and newly-hatched fry, known as alevins, require 65 to 90 days to absorb their yolk sacs (Pratt 1992). Consequently, fry do not emerge from the gravel and begin feeding for 200 or more days after eggs are deposited (Fraley and Shepard 1989), usually in about mid-April.

Fraley and Shepard (1989) reported that juvenile bull trout were rarely observed in streams with summer maximum temperatures exceeding 15°C (59°F). Fry, and perhaps juveniles, grow faster in cool water (Pratt 1992). Juvenile bull trout are closely associated with the substrate, frequently living on or within the streambed cobble (Pratt 1992). Along the stream bottom, juvenile bull trout use small pockets of slow water near high velocity, food-bearing water. Adult bull trout, like the young, are strongly associated with the bottom, preferring deep pools in cold water rivers, as well as lakes and reservoirs (Thomas 1992).

Juvenile adfluvial fish typically spend one to three years in natal streams before migrating in spring, summer, or fall to a large lake. After traveling downstream to a larger system from their natal streams, subadult bull trout (age 3 to 6) grow rapidly but do not reach sexual maturity for several years. Growth of resident fish is much slower, with smaller adult sizes and older age at maturity.

Juvenile bull trout feed primarily on aquatic insects (Pratt 1992). Subadult bull trout rapidly convert to eating fish and, as the evolution of the head and skull suggest, adults are opportunistic and largely nondiscriminating fish predators. Historically, native sculpins (*Cottus* spp.), suckers (*Catostomus* spp.), and mountain whitefish (*Prosopium williamsoni*) were probably the dominant prey across most of the bull trout range. Today, throughout most of the bull trout's remaining range, introduced species, particularly kokanee (*Oncorhynchus nerka*) and yellow perch (*Perca flavescens*), are often key food items (Pratt 1992).

Bull trout are habitat specialists, especially with regard to preferred conditions for reproduction. While a small fraction of available stream habitat within a drainage or subbasin may be used for spawning and rearing, a much more extensive area may be utilized as foraging habitat, or seasonally as migration corridors to other waters. Structural diversity is a prime component of good bull trout rearing streams (Pratt 1992). Several authors have observed highest juvenile densities in streams with diverse cobble substrate and low percentage of fine sediments (Shepard *et al.* 1984, Pratt 1992).

Persistence of migratory life history forms and maintenance or re-establishment of stream migration corridors is crucial to the viability of bull trout populations (Reiman and McIntyre 1993). Migratory bull trout facilitate the interchange of genetic material between populations, ensuring sufficient variability within populations. Migratory forms also provide a mechanism for reestablishing local populations that have been extirpated. Migratory forms are more fecund and larger than smaller non-native brook trout, potentially reducing the risks associated with hybridization (Reiman and McIntyre 1993). The greater fecundity of these larger fish enhances the ability of a population to persist in the presence of introduced fishes. On June 13, 1997, the Service proposed the Columbia Basin population of the bull trout as threatened and the Klamath population as endangered (USDI 1997a).

No permanent adverse effects to bull trout habitat are anticipated in association with Partners program projects. Any river restoration projects in the range of the species could result in beneficial effects to this species. Partners program projects that involve in-channel work could result in direct take of individual bull trout. Further, temporary increases in turbidity associated with Partners program projects could interfere with the species' foraging or spawning behavior. Any temporary water diversions associated with Partners program projects, if made at an inappropriate time of year, could interfere with the bull trout's migration patterns. In order to minimize project impacts to bull trout, the PDCs listed in Appendix D will be followed.

Chinook Salmon

Chinook salmon (*Oncorhynchus tshawytscha*), are listed as a threatened species in the Snake River basin (USDC 1992), and are proposed as threatened in the Upper Willamette River, the Lower Columbia River, and along the southern Oregon coast; chinook in the Deschutes River are proposed to be added to the threatened Snake River Evolutionarily Significant Unit (ESU) (USDC 1998a). The information that follows was taken from Beauchamp *et al.* (1983) except as noted. Chinook are anadromous salmonids, typically rearing in large streams, and migrating to the ocean where they live for an average of 3 to 4 years before returning to their natal streams to spawn before dying. Adult chinook can reach up to 22.7 kg (50 .1 lb) in weight, although some larger chinook have been recorded (Emmett *et al.* 1991). The chinook's coloration when in the ocean and prior to changing to spawning colors is a silvery-blue on the dorsal surface with silvery sides (Groot and Margolis 1991). The chinook has somewhat large, irregular spots on the back and upper sides, as well as the dorsal and adipose fins, and the entire caudal fin. The adult chinook is also distinguishable from coho due to its black gums, the coho has pale gums. Prior to spawning, the chinook turns a yellowish green on back and sides, with a pale grey to pink ventral surface (Groot and Margolis 1991).

After spending most of its adult life in the ocean, the chinook returns to its natal streams. The timing on the return to the natal streams and subsequent spawning varies dependent which of the three chinook runs is involved. The spring chinook returns to freshwater beginning in February, and spawn from August to November. The summer chinook enters freshwater during the late spring to mid-summer, and spawn in the fall. The fall chinook returns to its natal streams in fall and spawns in the fall or winter. Juvenile fry emerge from the gravel during the winter or early spring. Juveniles remain in freshwater from 1 to 18 months before migrating to the ocean.

Habitat conditions important to the survival and success of salmon include cool water temperatures, low turbidity, high levels of dissolved oxygen, gravel size, and stream-side vegetation and submerged cover for protection from predation and disturbance as well as providing shade. Chinook prefer stream water temperatures of 4 to 14.4° C (39.2 to 57.2°F), depending on life stage, and spawning gravel size of 1.3 to 10.2 cm (.51 to 4.02 in) in diameter (Emmett *et al.* 1991).

No permanent adverse effects to chinook habitat are anticipated in association with Partners program projects. Partners program projects that involve in-channel work could result in direct take of individual fish. Further, temporary increases in turbidity associated with Partners program projects aimed at improving habitat for salmonids and other native species could interfere with the species' foraging or spawning behavior. In order to minimize impacts to chinook, the PDCs listed in Appendix D will be followed.

Chum Salmon

Chum salmon (*Oncorhynchus keta*), is proposed as a threatened species in the Columbia River basin, which includes chum that spawn in Oregon's tributaries to the lower Columbia River (USDC 1998b). The information that follows was taken from Pauley *et al.* (1988), except as noted. Chum are anadromous salmonids, rearing in rivers of varying sizes, typically within 200 km (124 mi) of the sea, and migrating to the ocean where they live for 2 to 4 years (typically) before returning to their natal streams to spawn before dying. Adult chum average 4.0 to 7.0 kg (8.8 to 15.4 lb) in weight. The chum's coloration when in the ocean and prior to changing to spawning colors is a silvery-blue to -green on the dorsal surface with silvery sides. The chum lacks large black spots and is also distinguishable by its white tips on both pelvic and anal fins. Prior to spawning, the chum's coloration changes to reddish sides with a series of dark bars while some also have grey blotches.

After spending a majority of its life in the ocean, chum begin migrating upstream in summer and late fall (there are both summer and fall runs of chum). Spawning occurs within 6 weeks. In the spring, juvenile fry emerge from the gravel, and typically begin their migration downstream shortly after spawning. Young chum salmon spend some time in estuaries to grow and possibly to acclimate to saltwater prior to entering the open ocean.

Habitat conditions important to the survival and success of salmon include cool water temperatures, low turbidity, high levels of dissolved oxygen, gravel size, and stream-side vegetation and submerged cover for protection from predation and disturbance as well as providing shade. Chum prefer stream water temperatures of 4.4 to 15.6°C (39.9 to 60.1° F), depending on life stage, and spawning gravel size of 1.3 to 10.2 cm (.51 to 4.02 in) in diameter (Emmett *et al.* 1991).

No permanent adverse effects to chum habitat are anticipated in association with Partners program projects. Partners program projects that involve in-channel work could result in direct take of individual fish. Further, temporary increases in turbidity associated with Partners program projects aimed at improving habitat for salmonids and other native species could interfere with the species' foraging or spawning behavior. In order to minimize impacts to chum, the PDCs listed in Appendix D will be followed.

Coho Salmon

Coho salmon (*Oncorhynchus kisutch*), are listed as a threatened species in southern Oregon coastal streams (south of Cape Blanco), and are considered a candidate for listing in the remaining Oregon coastal streams (north of Cape Blanco) (USDC 1997a). The information that follows was taken from Laufle *et al.* (1986), except as noted. Coho are anadromous fish that rear in small, and occasionally large, streams, and migrate to the ocean where they live for 2 years before returning to their natal streams to spawn. Adult coho reach 3.6 to 4.5 kg (7.9 to 9.9 lb) in weight. The coho's coloration when in the ocean and prior to changing to spawning colors is a silvery-blue to -green on the dorsal surface with silvery sides. The coho's small black spots are restricted to the back and upper sides, dorsal fin base, and upper lobe of the caudal fin. The adult

coho is also distinguishable from chinook salmon based on its pale gums, as the chinook has black gums. Prior to spawning, the male's back gets darker in color, the sides become dulled with a bright red stripe, and the ventral surface is grey to black. The spawning female has a dull green back with dull red sides (Groot and Margolis 1991).

After spending 2 years in the ocean, coho return to coastal waters from the open ocean beginning in July. They return to their natal streams between August and February, where spawning occurs from late September to March. Juvenile coho emerge from the gravel between March and July, and spend 1 to 2 years in freshwater before migrating to the ocean from April to August.

Habitat conditions important to the survival and success of salmon include cool water temperatures, low turbidity, high levels of dissolved oxygen, gravel size, and stream-side vegetation and submerged cover for protection from predation and disturbance as well as providing shade. Coho prefer stream water temperatures of between 4.4 and 15.6° C (39.9 to 60.1° F), depending on life stage, and spawning gravel size of 1.3 to 10.2 cm (.51 to 4.02 in) in diameter (Emmett *et al.* 1991).

No permanent adverse effects to coho salmon habitat are anticipated in association with Partners program projects. Partners program projects that involve in-channel work could result in direct take of individual fish. Further, temporary increases in turbidity associated with Partners program projects aimed at improving habitat for salmonids and other native species could interfere with the species' foraging or spawning behavior. In order to minimize impacts to coho, the PDCs listed in Appendix D will be followed.

Foskett Speckled Dace

The Foskett speckled dace (*Rhinichthys osculus* ssp.) is a threatened species found in south central Oregon. The information for this section is contained in the Draft Recovery Plan of the Threatened and Rare Native Fishes of the Warner Basin and Alkali Subbasin (U.S. Fish and Wildlife Service 1997). There are two known populations of the Foskett speckled dace which inhabit isolated spring habitats in Foskett and Dace Springs in the Coleman Subbasin of the Warner Valley. This species is in decline due to modifications of their native habitat. These areas are currently stable, but extremely restricted. Any alterations to the springs or surrounding activities that indirectly modify the springs containing these two species could lead to the extinction of these species. Foskett and Dace Springs occur on public land and are managed by the Lakeview BLM. This habitat is currently fenced from cattle use and is in stable condition.

The Foskett speckled dace was listed as threatened in 1985 (USDI 1985b). Despite the undescribed status it can be distinguished from other speckled dace by external characteristics, such as: much reduced lateral line, about 15 scales with pores; about 65 lateral line scales; a large eye; the dorsal fin is positioned well behind the pelvic fin but before the beginning of the anal fin; and barbels are present on most individuals (C. Bond, pers. comm., 1990).

Both Foskett and Dace springs are extremely small and shallow with limited habitat for fish. Foskett Spring has the only known native population of Foskett speckled dace and originates in a pool about 5 meters (16.6 ft) across, then flows toward Coleman Lake in a narrow, shallow channel [approximately 5 cm (2 in) deep and 5 cm (2 in) wide]. The source pool has a loose sandy bottom and is choked with macrophytes. The outflow channel eventually turns into a marsh, and finally dries up. The Foskett speckled dace population was estimated in 1997 at 27,000 individuals in Foskett Spring (most in an ephemeral lower pool), and 19 dace in the nearby outplanted population in Dace Spring (J. Dambacher, pers. comm., 1998).

Nothing is known about the biology/ecology of the Foskett speckled dace. The only habitat information available regards plant species found around the springs which include rushes, sedges, monkey flowers (*Mimulus* ssp.), Kentucky bluegrass (*Poa pretensis*), thistle and saltgrass (*Distichlis spicata*). Foskett Spring is a cool-water spring with temperatures recorded at a constant 18°C (64.4°F) over a 2 year period (A. Munhall, pers. comm., 1997). No information is available on growth rates, age of reproduction or behavioral patterns.

Springs and wet meadow areas have relatively high amounts of soil moisture and can support higher levels of plant growth that extend longer into the season than drier sites. This can lead to a disproportionate amount of use by livestock, especially late in the grazing season. The impacts by livestock generally reduce the integrity and complexity of these spring areas in much the same way riparian areas are degraded. Impacts range from reduction of the riparian vegetation surrounding spring areas by trampling and grazing to increased sedimentation from trampling and decreasing aquatic vegetation from the smothering effects of silt. Some springs have also been tapped or partially diverted to watering troughs.

While it is unlikely that there will be any Partners program projects in the vicinity of this species, especially considering that it only occurs on public lands, no projects will entail any actions that take place within the spring pool and no pesticides will be used in the vicinity of Foskett or Dace Springs.

Hutton Tui Chub

The Hutton tui chub (*Gila bicolor* ssp.) is only found in Hutton spring in the Alkali Subbasin of the Chewaucan Basin in south-central Oregon. A second reported spring was not located in 1996 and therefore its existence is questionable. Bills (1977) performed an extensive examination of morphometric and meristic characters and found the Hutton tui chub to be distinguishable from other tui chub in adjacent basins by morphology of the head. These characters are: head has a convex outline, is longer (from tip of snout to rear edge of the gill cover), deeper, and the distance between the eyes is greater than other tui chub subspecies. The Hutton tui chub was listed as threatened in 1985 due to declines in the species habitat (USDI 1985).

Hutton Spring has been diked and has a pool approximately 12 meters (40 feet) wide, 4.5 meters

(15 feet) deep, is surrounded by rushes, and, in 1977, contained estimated 300 Hutton tui chub (Bills 1977). There is very little information regarding the ecology of the Hutton tui chub. Bills (1977) examined gut content and found the Hutton tui chub to be omnivorous with a majority of food eaten being filamentous algae. It appears that dense aquatic algae is needed for spawning and rearing of young (J. Williams, pers. comm., 1995). No information is available on growth rates, age of reproduction or behavioral patterns. Hutton Spring is privately owned and the habitat is in good condition primarily due to conscientious, long-term land stewardship by the landowner. This habitat is currently fenced from cattle use and is in stable condition. In order to preserve the Hutton Tui Chub population, no Partners program projects will impact the pool in Hutton Spring or any of the water within the currently fenced area. In addition, no pesticides will be used in the vicinity of Hutton Spring.

Lahontan Cutthroat Trout

Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*) (LCT) is one subspecies of the wide-ranging cutthroat trout that includes at least 14 recognized forms in the western United States. The spotting pattern on LCT helps distinguish the LCT from other subspecies of cutthroat trout (Behnke 1992). The LCT often exhibit spots on the top and sides of the head, extending to the tip of the snout (other interior species typically lack the spots on the head and ventral region) (USDI 1994). The coloration is generally dull, but reddish tones may appear on the sides and cheeks; the orange cutthroat slash is typically present to some degree, but yellow slashes also occur (USDI 1994). The Lahontan cutthroat trout is an obligatory stream spawner. Spawning occurs from April through July over gravel substrate in riffle areas. The eggs hatch in 4 to 6 weeks, and fry emerge 13 to 23 days later (USDI 1994).

Cutthroat trout have the most extensive range of any inland trout species of western North America (Behnke 1992), and occur in anadromous, non-anadromous, fluvial, and lacustrine populations. Many of the basins in which cutthroat trout occur contain remnants of much more extensive bodies of water which were present during the wetter period of the late Pleistocene epoch (Smith 1978).

Lahontan cutthroat trout historically occurred in most cold waters of the Lahontan Basin of Nevada and California, including the Humboldt, Truckee, Carson, Walker, and Summit Lake/Quinn River drainages. Large alkaline lakes, small mountain streams and lakes, small tributary streams, and major rivers were inhabited, resulting in the current highly variable subspecies. The fish occurred in Tahoe, Pyramid, Summit, Donner, Walker, and Independence Lakes, but has disappeared from Lake Tahoe, Pyramid, Donner and Walker lakes (Behnke 1992). The Pyramid lake population was extirpated primarily due to blockage of spawning tributaries (Behnke 1992). The subspecies has been extirpated from most of the western portion of its range in the Truckee, Carson, and Walker river basins, and from much of its historic range in the Humboldt basin. Only remnant populations remain in a few streams in the Truckee, Carson, and Walker basins out of an estimated 1,020 miles of historic habitat (Gerstung 1986). Coffin (1988) estimated that only 85 stream populations existed in the Humboldt Basin in a total

of 270 miles of habitat compared with an estimated historic occurrence in 2,210 stream miles.

The LCT inhabiting Oregon were originally classified as Willow Whitehorse cutthroat trout. Genetic and taxonomic investigations led to its re-classification as LCT in 1991 (Williams 1991). Willow-Whitehorse cutthroat were afforded protection and threatened status as LCT on November 4, 1991. The LCT occurs in the following Oregon streams: Willow Creek, Whitehorse Creek, Little Whitehorse Creek, Doolitle Creek, Fifteen Mile Creek (from the Coyote Lake Basin) and Indian, Sage, and Line Canyon Creeks (tributaries of McDermitt Creek in the Quinn River (NV) basin).

Sources and mechanisms of stream colonization outside of the Lahontan basin by LCT are uncertain, but human transport is suspected. Resident stream populations have been used to stock other Willow-Whitehorse area streams during the seventies and early eighties. These transplanted populations are considered threatened unless they are determined to be "experimental populations" released outside of the native range of the species for conservation purposes (USDI 1997b).

The severe decline in range and numbers of LCT is attributed to a number of factors, including hybridization and competition with introduced trout species; loss of spawning habitat due to pollution from logging, mining, and urbanization; blockage of streams due to dams; channelization; de-watering due to irrigation and urban demands; and watershed degradation due to overgrazing of domestic livestock (Gerstung 1986; Coffin 1988; Wydoski 1978). Declining LCT populations in the Whitehorse and Trout Creek Mountains are a result of decades of season-long intensive livestock grazing, recreational over-fishing, and more recently drought conditions from 1985 to 1994.

Oregon Department of Fish and Wildlife surveys indicated that LCT populations were reduced from 1985 to 1989 (USDI 1997b). Declining numbers of LCT prompted ODFW to close area streams to fishing (by special order) in 1989. This closure remains in effect. Fish surveys of area streams were conducted again in October of 1994. Although methods vary between the conducted surveys (1985, 1989 and 1994), fish numbers have increased in general from approximately 8,000 fish in the mid 1980s to approximately 40,000 fish in 1994. However, in many areas stream conditions remain less than favorable for the cutthroat; of the 70 miles surveyed less than 20 miles supported adequate densities of fish (USDI 1997b).

No permanent adverse effects to LCT habitat are anticipated in association with Partners program projects. Any river restoration projects conducted in the range of the species could have a beneficial effect to this species. Partners program projects that involve in-channel work could result in direct take of individual fish. Further, temporary increases in turbidity associated with Partners program projects could interfere with the species' foraging or spawning behavior. In order to minimize disturbance to LCT, the PDCs listed in Appendix D will be followed.

Lost River and Shortnose Suckers

The Lost River sucker (*Deltistes luxatus*) is a large sucker that may reach over 0.9 m (3 ft). It is characterized by a long, slender head with a subterminal mouth and long, rounded snout. The coloring is dark on the back and sides, fading to white or yellow on the belly. The only species in the genus *Deltistes*, the Lost River sucker is native to Upper Klamath Lake and its tributaries. This sucker also historically inhabited the Lost River watershed, Tule Lake, Lower Klamath Lake, and Sheepy Lake (Moyle 1976), but is not considered native to the Klamath River, although it is now found there, at least downstream to Copco Reservoir (Beak 1987).

The shortnose sucker (*Chasmistes brevirostris*) historically occurred in Upper Klamath Lake and its tributaries (Miller and Smith 1981). Its historic range likely included Lake of the Woods, Oregon, and probably the Lost River system (Scoppettone and Vinyard 1991). The current distribution of the shortnose sucker includes Upper Klamath Lake and its tributaries, Klamath River downstream to Iron Gate Reservoir, Clear Lake Reservoir and its tributaries, Gerber Reservoir and its tributaries, the Lost River, and Tule Lake. Gerber Reservoir represents the only habitat with a shortnose sucker population that does not also have a Lost River sucker population.

Both species are primarily lake residents that spawn in associated rivers, streams, or springs. After hatching, larval suckers migrate out of spawning substrates, which are usually gravels or cobbles, and drift downstream into lakes. Vegetated river and lake shoreline habitats are known to be important during larval and juvenile rearing (Klamath Tribe 1991; Markle and Simon 1993). The Lost River and shortnose suckers are omnivorous bottom feeders whose diets include detritus, zooplankton, algae and aquatic insects (Buettner and Scoppettone 1990). Sexual maturity for Lost River suckers sampled in Upper Klamath Lake occurs between the ages of 6 to 14 years with most maturing at age 9. Most shortnose suckers reach sexual maturity at age 6 or 7 (Buettner and Scoppettone 1990).

The Upper Klamath River Basin above Iron Gate Dam (Basin) encompasses a drainage area of approximately 2,120,400 hectares (5,301,000 acres) in Oregon and California (USFWS 1992). The Basin once had over 350,000 acres of wetlands (USFWS 1989a), extensive riparian corridors, and functional floodplains. Early records from the Basin indicate that the Lost River and shortnose suckers were common and abundant. Gilbert (1898) noted that the Lost River sucker was "the most important food-fish of the Klamath Lake region." Several commercial operations processed "enormous amounts" of suckers into oil, dried fish, canned fish, and other products (Andreasen 1975, Howe 1968). Currently, less than 75,000 acres of wetlands remain in the Basin (USFWS 1992).

The historical range of the Lost River and shortnose suckers has been fragmented by construction of dams, instream diversion structures, irrigation canals, and the general development of the U.S. Bureau of Reclamation's Klamath Project and related agricultural

processes. Because habitat fragmentation limits or prevents genetic interchange among populations, extinction could result as genetic diversity decreases and populations become more susceptible to environmental change. The combined effects of damming of rivers, instream flow diversions, draining of marshes, dredging of Upper Klamath lake, and other water manipulations has threatened both species with extinction (USDI 1988b). Additionally, water quality degradation in the Upper Klamath Lake watershed has led to large-scale fish kills related to algal bloom cycles in the lake (Kann and Smith 1993). Introduced exotic fishes may reduce recruitment through competition with, or predation upon, suckers (USFWS 1993, Dunsmoor 1993).

No permanent adverse effects to Lost River or shortnose sucker habitat are anticipated in association with Partners program projects. Any river restoration projects conducted within the range of the species could result in long-term beneficial effects to these species. Partners program projects that involve in-channel work could result in direct take of individual suckers. Further, temporary increases in turbidity associated with Partners program projects could interfere with the species' foraging or spawning behavior. Any temporary water diversions associated with Partners program projects, if made at an inappropriate time of year, could interfere with the species' migration patterns. In order to minimize disturbance to Lost River and shortnose suckers, the PDCs listed in Appendix D will be followed.

Oregon Chub

The Oregon chub (*Oregonichthys crameri*) is a small minnow endemic to the Willamette River Basin in western Oregon. The chub was listed by the U.S. Fish and Wildlife Service as endangered in 1993. Critical habitat has not been designated for Oregon chub. For a complete discussion of the ecology and life history of this species, see the final rule listing the chub as endangered (USDI 1993c). The information below is extracted from that document. A recovery plan for the Oregon Chub is presently being developed.

Oregon chub and its sibling Umpqua chub have an olive colored back grading to silver on the sides and white on the belly. Scales are relatively large with fewer than 40 occurring along the lateral line; scales near the back are outlined with dark pigment. The main distinguishing characteristics between Oregon and Umpqua chub are: the greater length of the caudal peduncle in the Oregon chub; the mostly scaled breast on Oregon chub versus three fourths to fully naked breast of Umpqua chub; and the Oregon chub's more terminal mouth position, versus Umpqua chub's subterminal mouth. Several size classes of Oregon chub have been collected. Young of the year are approximately 7 to 32 mm (0.27 to 1.26 in), presumed 1+ year chub are approximately 33 to 46 mm (1.3 to 1.81 in), presumed 2+ year chub are approximately 47-64 mm (1.85 to 2.52 in), and presumed 3+ year fish are >65 mm (2.56 in). The largest Oregon chub was collected from the North Santiam River and measured 89 mm (3.5 in) in length.

Oregon chub are endemic to the Willamette River drainage of western Oregon. Typically they occupy off-channel habitats such as beaver ponds, oxbows, side channels, backwater sloughs,

low gradient tributaries, and flooded marshes. This species was formerly distributed throughout the Willamette River Valley as far downstream as Oregon City and as far upstream as Oakridge. Historical records report Oregon chub were collected from the Clackamas River, Molalla River, South Santiam River, North Santiam River, Luckiamute River, Long Tom River, McKenzie River, Mary's River, Coast Fork Willamette River, Middle Fork Willamette River, and the mainstem Willamette River from Portland to Eugene.

The current distribution of Oregon chub is limited to 19 naturally occurring populations and three recently reintroduced populations. The naturally occurring populations are found in the North Santiam River (4 populations), Mary's River (1 population), Muddy Creek in Linn County (1 population), Middle Fork Willamette River (11 populations), and Coast Fork Willamette River (1 population). Only four of these populations have more than 1000 fish, and 12 populations contain fewer than 50 individuals. The Oregon chub was petitioned for federal listing in 1990, and subsequently listed in 1993. Subsequent to listing, three populations of Oregon chub have been introduced into habitats in the Middle Fork Willamette River drainage at Wicopee Pond, East Ferrin Pond, and Fall Creek Spillway Pond.

Oregon chub habitats usually have little or no water flow, silty and organic substrate, and considerable aquatic vegetation as cover for hiding and spawning (Markle *et al.* 1991; Scheerer and Jones 1997). The average depth of Oregon chub habitats is typically less than 2 m and the summer temperatures typically exceed 16^{o} C (60.8^{o} F). Adult Oregon chub seek dense vegetation for cover and frequently travel in beaver channels or along the margins of macrophyte beds. In the early spring, fish are most active in the warmer, shallow areas of the ponds. Larval chub congregate in shallow areas near the shore (Pearsons 1989, Scheerer 1997). Juvenile Oregon chub venture farther from shore into deeper water (Pearsons 1989). In the winter months, Oregon chub are found buried in detritus or concealed in the limited aquatic vegetation (Pearsons 1989; P. Scheerer, pers. comm.). Fish of similar size classes school and feed together.

Oregon chub spawn from April through September. Before and after spawning season, chub are social and non-aggressive. Spawning behavior, as described by Pearsons (1989), begins with the male establishing a territory in or near dense aquatic vegetation and aggressively excluding other males. When an adult female enters the territory the courting begins. The male rubs his head in the ventral region of the female between the pectoral and anal fins and directs her into the aquatic vegetation by slight changes in the angle and pressure of the head on the lateral undersides of the female. Twirling of both fish, arranged head to head, follows, and eggs and sperm are released. Spawning activity has only been observed at temperatures exceeding 16^{o} C (60.8^{o} F). Males >35 mm have been observed exhibiting spawning behavior. Female egg masses have been found to contain 147 to 671 eggs (Pearsons 1989).

Oregon chub feed throughout the day, mostly on water column fauna, and stop feeding after dusk (Pearsons 1989). The diet for Oregon chub adults collected in a May sample consisted primarily of copepods, cladocerans, and chironomid larvae (Markle *et al.* 1991). The diet of juvenile chub

consisted of rotifers, copepods, and cladocerans. (Pearsons 1989).

In the last 80 years, backwater and off-channel habitats typically occupied by the Oregon chub have disappeared rapidly because of changes in seasonal flows resulting from the construction of dams throughout the basin, channelization of the Willamette River and its tributaries, removal of snags for river navigation, and agricultural practices. As a result, available Oregon chub habitat was reduced, existing Oregon chub populations were isolated, and recolonization of habitat and mixing between populations was reduced. In addition, a variety of non-native aquatic species were introduced to the Willamette Valley over the same period. The establishment and expansion of these non-native species, in particular, largemouth bass (*Micropterus salmoides*), smallmouth bass *(Micropterus dolomicu*), crappie (*Pomoxis* sp.), bluegill (*Lepomis macrochirus*), western mosquitofish (*Gambusia affinis*) and bullfrog (*Rana catesbiana*), has contributed to the decline of the Oregon chub and limits the species' ability to expand beyond its current range.
Many of the known extant populations of Oregon chub occur near rail, highway, and power transmission corridors and within public park and campground facilities. These populations are threatened by chemical spills from overturned truck or rail tankers; runoff or accidental spills of brush control chemicals; overflow from chemical toilets in campgrounds; siltation of shallow habitats from logging and construction activities; and changes in water level or flow conditions from construction, diversions, or natural desiccation.

No permanent adverse effects to Oregon chub habitat are anticipated in association with Partners program projects. Any river restoration projects conducted within the range of the species could have a beneficial effect to this species. Partners program projects that involve in-channel work could result in direct take of individual fish. Further, temporary increases in turbidity associated with Partners program projects could interfere with the species' foraging or spawning behavior. In order to minimize disturbance to Oregon chub, the PDCs listed in Appendix D will be followed.

Sea-run Cutthroat Trout

Sea-run cutthroat trout (*Oncorhynchus clarki clarki*), are listed as an endangered species in the Umpqua River basin (USDC 1996), and are considered candidates for listing elsewhere throughout their range (USDC 1997b). The information that follows was taken from Pauley *et al*. (1989a), except as noted. Sea-run cutthroat are anadromous salmonids, spawning and rearing in small tributaries of small or large streams, and migrating to the near-coastal ocean where they spend less than one year before returning to their natal streams to spawn. Sea-run cutthroat, like rainbow trout, are unlike other salmonids in that they do not die after spawning, but can repeat the migration to and from the ocean several times to spawn. Adult sea-run cutthroat trout reach up to 2.7 kg (5.95 lb) in weight. When in the ocean and prior to changing to spawning colors, the cutthroat is silvery in coloration with small black spots are on the back, head, and sides to below the lateral line, as well as on the anal and caudal fins. The sea-run cutthroat's spawning

coloration is darker; the males gain an amber hue with pinkish-orange sides (Trotter 1987). The primary distinguishing characteristic in sea-run cutthroat is the orange to red streak along the lower jaw, which is faint in the ocean fish, and brightens as the fish gets closer to spawning (Trotter 1987).

After spending one growing season in the ocean, sea-run cutthroat return to their natal streams from July to March (timing varies with geographic location; within-stream returns occur within in a fairly close time-frame). Spawning occurs in late winter and spring. Juveniles migrate down-river from March to June, although this species may migrate several times within the river before migrating to the ocean.

Habitat conditions important to the survival and success of salmon include cool water temperatures, low turbidity, high levels of dissolved oxygen, gravel size, and stream-side vegetation and submerged cover for protection from predation and disturbance as well as providing shade. Cutthroat trout prefer stream water temperatures of 9 to 12°C (48.2 to 53.6°F), depending on life stage, and a spawning gravel size of 0.6 to 10.2 cm (0.24 to 4.02 in) in diameter (Emmett *et al.* 1991).

No permanent adverse effects to cutthroat trout habitat are anticipated in association with Partners program projects. Partners program projects that involve in-channel work could result in direct take of individual fish. Further, temporary increases in turbidity associated with Partners program projects aimed at improving habitat for salmonids and other native species could interfere with the species' foraging or spawning behavior. In order to minimize impacts to cutthroat trout, the PDCs listed in Appendix D will be followed.

Sockeye Salmon

The sockeye salmon (*Oncorhynchus nerka*), is listed as an endangered species in the Snake River basin (USDC 1991). The information that follows was taken from Pauley *et al.* (1989b), except as noted. Sockeye are anadromous salmonids, rearing in lakes or the portions of streams that flow into or out of lakes, and migrating to the ocean where they live for 1 to 4 years (typically 2) before returning to their natal lakes/streams to spawn before dying. Adult sockeye average 1.58 to 3.16 kg (3.48 to 6.97 lb) in weight (Groot and Margolis 1991). Their coloration when in the ocean and prior to changing to spawning colors is a green-blue dorsal surface with silvery sides. The spotting pattern is often a distinguishing characteristic between species. The sockeye's fine black speckling on the back is free of larger spots, and there is no spotting on its dorsal or caudal fins. Prior to spawning, the body of the sockeye body turns a bright red, and the head of the male turns light green.

After spending 1 to 4 years in the ocean (typically 2), sockeye return to their natal streams between June and September (Groot and Margolis 1991). Spawning occurs from August to January. Juvenile fry emerge from the gravel from April to May and spend 1 to 2 years in the rearing lakes, before migrate to the ocean in the spring.

Habitat conditions important to the survival and success of salmon include cool water temperatures, low turbidity, high levels of dissolved oxygen, gravel size, and stream-side vegetation and submerged cover for protection from predation and disturbance as well as providing shade. Sockeye prefer stream water temperatures of 4 to 15.6°C (39.2 to 60.1°F), depending on life stage (Emmett *et al.* 1991), and a spawning gravel size of 1.3 to 10.2 cm (0.51 to 4.02 in) in diameter (Bjornn and Reiser 1991).

No permanent adverse effects to sockeye salmon habitat are anticipated in association with Partners program projects. Partners program projects that involve in-channel work could result in direct take of individual fish. Further, temporary increases in turbidity associated with Partners program projects aimed at improving habitat for salmonids and other native species could interfere with the species' foraging or spawning behavior. In order to minimize impacts to sockeye, the PDCs listed in Appendix D will be followed.

Steelhead Trout

Steelhead trout *(Oncorhynchus mykiss*), are listed as a threatened species in the Snake River basin (USDC 1997c) and the Lower Columbia River (USDC 1998c), are proposed for listing in the Upper Willamette River and the Middle Columbia River (USDC 1998d), and are considered candidate species in the Klamath Mountains Province and Oregon coastal streams (USDC 1998c). The information that follows was taken from Pauley *et al.* (1986), except as noted. Steelhead are an anadromous species, typically rearing in large streams, and migrating to the ocean where they live for 2 to 3 (and occasionally 4) years before returning to their natal streams to spawn. Steelhead are unlike other salmonids in that they may return to their natal streams several times to spawn before they die. Adult steelhead reach up to 19.5 kg (43 lb) in weight. Their coloration when in the ocean and prior to changing to spawning colors is a silvery-blue on the dorsal surface with silvery sides. The steelhead has black spots on the back and the dorsal and caudal fins, and a complete lateral line, with a slight anterior curve. Prior to spawning, the steelhead gets considerably darker in color, and the male has a pink to red band on the sides. Steelhead are distinguished from cutthroat trout by the absence of a red or orange dash under the lower jaw.

After spending 2 to 3 years in the ocean, steelhead return to their natal streams. There are two runs of steelhead: a winter and a summer run. Winter steelhead return to their natal stream in the late fall or winter and spawn by May. Summer steelhead migrate to their native stream during spring and summer, and spawn the following spring. Fry emerge from the gravel four to eight weeks later and spend 1 to 4 years in freshwater before migrating to the ocean.

Habitat conditions important to the survival and success of salmon include cool water temperatures, low turbidity, high levels of dissolved oxygen, gravel size, and stream-side vegetation and submerged cover for protection from predation and disturbance as well as providing shade. Stream water temperatures of 8 to 21°C (46.4 to 69.8°F) appear best for

steelhead, depending on life stage, and they prefer a spawning gravel size of less than 0.85 cm (0.33 in) in diameter, with rubble for rearing (Emmett *et al.* 1991).

No permanent adverse effects to steelhead trout habitat are anticipated in association with Partners program projects. Partners program projects that involve in-channel work could result in direct take of individual fish. Further, temporary increases in turbidity associated with Partners program projects aimed at improving habitat for salmonids and other native species could interfere with the species' foraging or spawning behavior. In order to minimize impacts to steelhead trout, the PDCs listed in Appendix D will be followed.

Warner Sucker

The Warner sucker (*Catostomus warnerensis*) is a threatened species occurring in water bodies within the Warner valley of south central Oregon. This species is in decline due to modifications of their native habitat. The information in the following sections is from the Draft recovery plan for the threatened and rare native fishes of the Warner basin and Alkali subbasin (USFWS 1997c).

The Warner sucker is a slender-bodied fish that grows to a maximum recorded fork length of 456 mm (17.9 in). The dorsal two-thirds of the head and body are blanketed with dark pigment, which borders creamy white lower sides and belly. During the spawning season, males have a brilliant red lateral band along the midline of the body; female coloration is lighter. Sexes can be distinguished by the anal fin shape (Coombs *et al.* 1979); the male's is broad and rounded distally, while the female's is narrower in appearance and nearly pointed or angular. The Warner sucker was federally listed as threatened in September 1985 and is also listed by the state of Nevada.

There is essentially one metapopulation of the Warner sucker which is endemic to the streams and lakes geographically delineated by the Warner Basin. The Warner Basin extends from southeast Oregon into extreme northern Nevada and California. The probable historic range of the Warner sucker includes the main Warner Lakes (Pelican, Crump, and Hart), and other accessible standing or flowing water in the Warner Valley, including the low to moderate gradient reaches of the tributaries which drain into the Valley. These tributaries include Deep Creek, the Honey Creek drainage, Snyder Creek and the Twentymile Creek drainage, including Greaser Reservoir (White *et al.* 1990). In Twelvemile Creek, a tributary to Twentymile Creek, the historic range of the sucker extended through Nevada and back into Oregon, but probably not as high as the California reach of the stream.

The Warner sucker currently inhabits the lakes and low gradient stream reaches of the Warner Valley, and is represented by a lake morph and a stream morph. Stream fish prefer long pools with undercut banks, containing high macrophytic coverage of substrates (≥70%) and root wads or large boulders, with a maximum depth of 1.5 meters (5 ft), a 2°C (35.6°F) differential between

the surface and the pool bottom, and overhanging vegetation (often *Salix* sp.). Lake fish prefer the deepest available habitat where food is plentiful. A variety of studies have shown that when adequate water is present, Warner suckers may inhabit all the lakes, sloughs, and potholes in the Warner Valley. The documented range of the sucker extended as far north into the ephemeral Flagstaff Lake during high water in the early 1980's, and again in the 1990's (Allen *et al.* 1996).

Warner sucker larvae have terminal mouths and short digestive tracts, enabling them to feed selectively in midwater or on the surface. Invertebrates, particularly planktonic crustaceans, make up most of their diet. As the suckers grow, they develop subterminal mouths, longer digestive tracts, and gradually become generalized benthic feeders on diatoms, filamentous algae, and detritus. Adult stream morph suckers forage nocturnally over a wide variety of substrates such as boulders, gravel, and silt. Adult lake morph suckers are thought to have a similar diet, but feed over predominantly muddy substrates (Tait and Mulkey 1993a,b).

Sexual maturity occurs at an age of 3 to 4 years (Coombs *et al.* 1979). Spawning usually occurs in April and May in streams, although variations in water temperature and stream flows may result in either earlier or later spawning. Temperature and flow cues appear to trigger spawning, with most spawning taking place at 14-20°C (57-68°F) when stream flows are relatively high. The Warner sucker spawns in sand or gravel beds in slow pools (White *et al.* 1990, 1991; Kennedy and North 1993). In years when access to stream spawning areas is limited by low flow or by physical in-stream blockages (such as beaver dams or diversion structures), suckers may attempt to spawn on gravel beds along the lake shorelines.

Larvae are found in shallow backwater pools or on stream margins where there is no current, often among or near macrophytes. Young of the year are often found over deep, still water from midwater to the surface, but also move into faster flowing areas near the heads of pools (Coombs *et al.* 1979). Juveniles (1 to 2 years old) are usually found at the bottom of deep pools or in other habitats that are relatively cool and permanent such as near springs.

The major threats to the continued existence of the Warner Sucker are human induced stream channel and watershed degradation, irrigation diversion practices and predation and competition from introduced fishes. Cattle grazing is ubiquitous throughout the interior basins of Oregon, and has had profound impacts on the streams in the Warner Valley (White *et al.* 1991). Not only do cattle trample streamside vegetation, destroy undercut banks and increase erosion in spawning streams, but their cumulative impacts often result in the dropping of water tables. This can cause disruptions in the flood process, nutrient inflow, peak and dry season flows and their velocities, and has resulted in stream down cutting in many areas within the range of the Warner Sucker.

Water diversion structures (which first appeared in the Warner Valley in the 1930's) can block upstream migration to spawning grounds and divert water and fish of all ages into fields and adjacent uplands where they are destined to perish. Diversion screening has been attempted by ODFW, but no screens have remained in place due to maintenance problems (USFWS 1997c).

Over a series of drought years, reduced flows can cause drops in lake levels and sometimes, especially in conjunction with lake pumping for irrigation, cause complete dry-ups, as was the case with Hart Lake in 1992.

The introduction of exotic piscivorus fishes disrupted this balance and the native ichthyofauna has suffered. In the early 1970s, ODFW stocked white crappie (*Pomoxis annularis*), black crappie (*P. nigromaculatus)*, and largemouth bass (*Micropterus salmoides*), in Crump and Hart Lakes. Prior to this, brown bullhead (*Ameiurus nebulosus*) and non-native rainbow trout were introduced into the Warner Valley. The adults of all five species feed on small fishes to varying degrees (Wydoski and Whitney 1979), while the larvae of the crappie and bullhead compete directly with young suckers for food.

No permanent adverse effects to Warner sucker habitat are anticipated in association with Partners program projects. Any restoration projects conducted within the range of the species could result in long-term beneficial effects to these species. Partners program projects that involve work in lakes or streams inhabited by the Warner sucker could result in direct take of individual suckers. Further, temporary increases in turbidity associated with Partners program projects could interfere with the species' foraging or spawning behavior. Any temporary water diversions associated with Partners program projects, if made at an inappropriate time of year, could interfere with the species' migration patterns. In order to minimize disturbance to Warner suckers, the PDCs listed in Appendix D will be followed.

AMPHIBIANS

Spotted Frogs

Recent genetic work shows that the taxon formally known as the West Coast population of the spotted frog is actually distinct to a point of being recognized as a full species (Green *et al*. 1996). Green *et al*. (1997) names the two species of spotted frogs that occur in the western States as the Oregon spotted frog (*Rana pretiosa*) and the Columbia spotted frog (*Rana luteiventris*). The Columbia spotted frog is found from extreme southwestern Yukon, through the Alaska panhandle and most of British Columbia, to Washington east of the Cascades, Idaho, western Montana, eastern Oregon, and northwestern Wyoming. Disjunct populations of the Columbia spotted frog occur in southeastern Oregon, southwestern Idaho, the Bighorn Mountains of Wyoming, the Mary's, Reese, and Owyhee River systems in Nevada, the Wasatch Mountains, and the western desert of Utah (Green *et al*. 1997). Based on this information, the West Coast population of the spotted frog should now be known as the Oregon spotted frog (*Rana pretiosa*) with a consequent change in listing priority number.

1. Columbia Spotted Frog

The Great Basin population of the Columbia spotted frog (*Rana luteiventris*) is a candidate for

Endangered Species Act protection. This candidate species occurs in Oregon in the Owyhee, Wallawa, and Blue Mountains. The following species information is from the candidate assessment form (USDI 1997c). The Columbia spotted frog is closely associated with surface waters; it is dependent on wetlands for over-wintering, breeding, and foraging habitats. Habitat in the Great Basin is seasonally xeric. Spotted frogs commonly use areas such as spring heads and deep undercuts with overhanging vegetation. Adults move to breeding areas in the spring, which may be hundreds of meters away from over-wintering sites. Breeding typically takes place in pooled water with floating/emergent vegetation. This may occur as soon as snow or ice melts from water surface, and may be completed within 2 days at higher elevations. Successful egg production, development, and metamorphosis of spotted frogs depend on hydration, adequate water depth, overhanging vegetation, appropriate pH and temperature, and the absence or low density of non-native fish and bullfrogs.

Threats to the existence of the spotted frog include:

1) Livestock degradation of habitat: Mismanagement of livestock grazing may result in the removal of cover vegetation, degradation of water quality, breakdown of bank overhangs, rechanneling of water and dessication of meadows and ponds. A 1994 spotted frog survey in southeastern Oregon found spotted frogs only in a stream protected by cattle exclosure. Other reports indicate that responsible grazing practices may, in some cases, maintain suitable spotted frog habitat by controlling some aquatic plants (Bull and Hayes, pers. com, 1998).

2) Loss or fragmentation of habitat by spring development, wetland loss, road construction, and a reduction in beaver populations.

3) Degraded water quality as a result of seepage through from mine spoils.

4) Predation by nonnative species: Both bullfrogs and non-native salmonid and bass species occur in the Great Basin and are suspected predators of the spotted frog. The bullfrog may also compete for breeding sites, or interrupt spotted frog courtship (Hayes, pers. comm., 1998).

Any Partners program projects that take place in Columbia spotted frog habitat are expected to benefit the species in the long term, although short term negative impacts (e.g., sedimentation) may occur. In order to minimize impacts to the Columbia spotted frog, the PDCs listed in Appendix D will be followed.

2. Oregon Spotted Frog

Historically, the Oregon spotted frog (*Rana pretiosa*) was recorded from 8 localities in western Washington, 44 localities in Oregon, 3 localities in California, and 1 site in British Columbia. Extensive surveys have recently been completed, and the species is currently documented from 3

sites in Washington, and 19 sites in Oregon. The species has not been found for 15 years at the British Columbia site, and no longer is extant in California. Based on historical sites, the Oregon spotted frog has disappeared from approximately 76 percent of its range (25 sites). This figure may be conservative due to the lack of historic collections at low elevation sites; the species has been estimated to be extirpated from 90 percent of its range based on geographic analysis. It is estimated that over 95 percent of the habitat that is suitable for the Oregon spotted frog has been surveyed across its range (Hayes 1997).

The Oregon spotted frog historically ranged from extreme southwestern British Columbia, Canada, south through the eastern side of the Puget/Willamette Valley trough and the Columbia River gorge, to the central Cascade mountains of Oregon, south into the Klamath Basin and northeastern California. The species is associated with non-woody wetland plant communities, along the marshy edges of ponds, lakes, and slow-moving streams. Breeding occurs February through March at lower elevations and late May to early June at higher elevations. Males are not territorial and may gather in large groups of 25 or more individuals at specific locations. Females deposit their egg masses at the same locations in successive years. Tadpoles metamorphose during their first summer.

The Oregon spotted frog faces threats to its warm water marsh habitat from development, changes in hydrology, and water quality and overgrazing. Although moderate livestock grazing in some instances benefits the spotted frog by maintaining openings in the vegetation, overgrazing can adversely affect the habitat causing severe hydrologic modification. In addition, preliminary results from studies being conducted at two sites in Oregon show a significant improvement in the vegetation in areas where cattle are excluded.

Adverse affects from hydrologic changes are a significant threat to the spotted frog. Modification of river hydrology from the series of dams in the Willamette Valley and the Puget Trough has significantly reduced the amount of shallow overflow wetland habitat historically used by the spotted frog. In the Cascades, reservoirs have inundated large marsh complexes and fragmented remaining marshes, thereby reducing the survival of the Oregon spotted frog in these areas. Range-wide, over 50 percent of the extant Oregon spotted frog sites face threats from changes in hydrology.

Development threatens the spotted frog at several sites. For example, in Washington, the Dempsey Creek site near Olympia is privately owned by landowners who have recently expressed interest in subdividing or selling their land for development. The Nature Conservancy has purchased approximately 200 acres of the 1,200 acre Trout Lake site. The Department of Natural Resources has started the acquisition process to protect additional acres at this site, however, the remaining land at this site is vulnerable to subdivision. In Oregon, the landowner at the LaPine Creek site has expressed a desire to develop the property.

At Paulina Marsh, an historic site in Oregon, only 1 frog was found in 1991, and frogs have not been found there since. The loss of this site is probably due to a number of factors, including

drought, habitat degradation from livestock, and the presence of brook trout.

Predation by exotic species such as warm water fishes and bullfrogs (*Rana catesbeiana*) adversely affect the Oregon spotted frog. The spotted frog is unique among the native ranids of the Pacific Northwest in that it requires warm water habitat, which is also habitat for a number of introduced fish. During recent surveys in Oregon, at least one exotic predator occupied 17 of 19 sites where spotted frogs were found (Hayes 1997). Brook trout was the most frequently recorded exotic aquatic predator, occurring at 16 of the sites. These introduced fish prey on the tadpoles of native amphibians. The Oregon spotted frog did not evolve with these fish and do not have mechanisms to deter their predation. Evidence that exotic fish adversely affect the Oregon spotted frog comes from 1) demographics data that show sites that contain a disproportionate ratio of older spotted frogs to juvenile frogs (i.e., poor recruitment) also have significant numbers of brook trout; and 2) results of studies on other native amphibians that show lower densities of larvae or egg masses in areas containing high densities of fish (Tyler *et al*. 1996).

The invasion of such exotic plants as reed canary grass may eliminate areas of suitable breeding habitat for the Oregon spotted frog by creating such dense areas of vegetation that the frogs cannot gain access for breeding. A study currently underway in Washington is investigating this possibility.

Drought causes seasonal loss of habitat and degradation of essential shoreline vegetation and is considered a threat to the species. During extended droughts, spotted frogs are more vulnerable to predation as a result of reduced cover. Further, reduced water levels confine the frogs to smaller areas where they are more vulnerable to predators such as introduced fish.

The majority of the Oregon spotted frog populations are small, which makes them vulnerable to stochastic events such as drought and disease. Only 5 of 21 populations are considered large (greater than 1,000 individuals). Six populations contain fewer than 100 individuals. One site (Jack Creek, Klamath Co.) contains a relatively large number of larvae and juveniles, but very few adult frogs. There appears to be a lack of either adult survivorship or a lack of recruitment after the juvenile stage. Poor recruitment could lead to the loss of this site. Two of the five large sites face imminent threats from either brook trout predation or habitat degradation.

No permanent adverse effects to spotted frog habitat are anticipated in association with Partners program projects. Any aquatic restoration projects conducted within the range of the species could result in beneficial effects to this species. Partners program projects that involve in-water activities could result in direct take of individual spotted frogs. Temporary increases in turbidity associated with Partners program projects could interfere with the species' foraging or spawning behavior. In order to minimize disturbance to spotted frogs, the PDCs listed in Appendix D will be followed.

INVERTEBRATES

Fender's Blue Butterfly

Fender's blue butterfly (*Icaricia icarioides fenderi*), a candidate for Federal listing, was first described as *Plebejus maricopa fenderi*, from specimens collected in Yamhill County, Oregon. The genus *Plebejus* has since been split, with some of its members, including the Fender's blue butterfly, assigned to the genus *Icaricia.* Males of this subspecies are silvery-blue on the dorsal wing surface and gray on the ventral wing surface. The upper wing surface of female butterflies is a brown ground color, with a wing underside similar in appearance to that of the male. The ventral hindwing often has a series of small, black spots near the margin of the wing.

Only a limited number of collections were made between the time of the subspecies' discovery and Macy's last observation on 23 May, 1937 in Benton County, Oregon (Hammond and Wilson 1992). Searches were made, but a lack of information on the butterfly's host plant prevented researchers form focusing their efforts. Finally, in 1989, the Fender's blue butterfly was rediscovered by Dr. Paul Hammond at McDonald Forest, Benton County, Oregon on Kincaid's lupine, an uncommon species.

Prior to the rediscovery of this species in 1989, the taxonomy of the Fender's blue butterfly was unclear due to the limited number of specimens available. The confusion arises from the similarity in appearance between the Fender's blue butterfly and the Pardalis blue butterfly (*Icaricia icarioides pardalis*), an inhabitant of the central California Coast Range near San Francisco. Recent comparison of specimens (Hammond and Wilson 1993) indicates significant morphological differentiation between populations of Fender's blue butterflies and Pardalis blue butterflies, confirming the status of these two taxa as distinct subspecies.

The historic distribution of the Fender's blue butterfly is unknown due to the limited information initially collected on this species. Recent surveys, however, indicate that the Fender's blue butterfly is confined to the Willamette Valley and currently occupies 21 sites in Yamhill, Polk, Benton and Lane counties (Hammond and Wilson 1992). One population at Willow Creek (Lane Co.) is found in wet, tufted hair grass (*Deschampsia- caespitosa*) type prairie, while the remaining sites are found on drier upland prairies characterized by Fescue grasses (*Festuca* spp.). Sites occupied by the Fender's blue butterfly are located almost exclusively on the valley's western side, within 26 km (16.15 mi) of the Willamette River.

This butterfly's life cycle appears to parallel that described for other subspecies of *Icaricia icarioides* (Hammond and Wilson 1993). Adult butterflies lay their eggs on host plants during May and June. Newly hatched larvae feed for a short time, reaching their second instar in the early summer, at which point they enter an extended diapause. Diapausing larvae remain at or near the base of the host plant through fall and winter and become active again the following March or April. Once diapause is broken, the larvae feed and grow through three to four additional instars, metamorphosing into adult butterflies in April and May. This life cycle allows for the completion of only one generation per year.

Behavioral observations of Fender's blue butterfly larvae indicate an extremely cautious nature, with individuals noted to drop from their feeding position on lupine leaves to the base of the plant at the slightest sign of disturbance (C. Schultz, University of Washington, pers. comm., 1994). Though many Lycaenids are tended by ants during their larval stage, observations of Fender's blue butterfly larvae in the field have failed to document such an a mutualistic association.

The preference of the Fender's blue butterfly for Kincaid's lupine has been supported through extensive searches of other neighboring lupine species throughout the butterfly's range. Of the many lupine species examined, secondary use of only two additional lupine species has been documented--*L. laxiflorus* (spurred lupine) and *L. albicaulis* (sickle-keeled lupine). Feeding on these two lupines has been noted at seven of 21 sites that support Fender's blue butterflies. At each site, however, *L. sulphureus* ssp. *kincaidii* is present nearby and is the predominant lupine species in all but one instance (Hammond and Wilson 1992).

The Fender's blue butterfly is limited in range to upland prairie remnants in western Oregon. Current estimates indicate that fewer than 400 ha. (1,000 acres) of native upland prairie remain in the Willamette Valley, only one-tenth of 1 percent of the original upland prairie once available to the Fender's blue butterfly. The immediate threat of habitat loss has been well documented. Habitat in western Polk County is rapidly disappearing due to housing and tree farm development (Hammond 1996). Between 1990 and 1992, three occurrences of both the Fender's blue butterfly and Kincaid's lupine were lost to the expansion of Christmas tree farming operations (Hammond 1996). Conversion of these three sites destroyed approximately 3 hectares (7 acres) of private and roadside habitat that comprised the nucleus of two Fender's blue butterfly populations. The two roadside occurrences of the butterfly that remain nearby are no longer considered viable due to the loss of the source butterfly populations and host plants. Urban development, agriculture, and tree farm cultivation have removed habitat from several additional populations since 1992, causing the butterflies to be extirpated or reduced to very low numbers. Housing development is also planned for the Dallas site in Polk County (Hammond 1996).

Fender's blue butterfly populations are additionally threatened by virtue of their small size. Over half of the sites occupied by these butterflies are parcels of 3 hectares (7.4 acres) or less. These occurrences, predominantly roadsides and fence line/boundary sites, face an immediate threat of destruction through development, agriculture, roadside maintenance and herbicide application. Of the 21 sites, only three are considered secure, and two of these are facing management problems. Even without habitat destruction, such extremely small population fragments would be subject to the adverse effects of low genetic variability, as well as extirpation due to stochastic events.

Effects to Fender's blue butterflies associated with Partners program projects would most likely result from adverse modification of the species' habitat. In order to minimize impacts to these

butterflies and their habitat, the PDCs listed in Appendix D will be followed.

Oregon Silverspot Butterfly

The Oregon silverspot butterfly (*Spyeria zerene hippolyta*) is a darkly marked coastal subspecies of the Zerene fritillary, a widespread species in montane western North America. The historical range of the subspecies extends from the Long Beach Peninsula, Pacific County, Washington, south to Del Norte County, California. Within its range, the butterfly is known to have been extirpated from at least 11 colonies (two in Washington, eight in Oregon, and one in California). The Oregon silverspot butterfly was listed as a threatened species with Critical Habitat by the Service in 1980. For a complete discussion of the ecology and life history of this subspecies, see that final rule (USDI 1980). The information below is extracted from that document.

Historically, the Oregon silverspot butterfly was distributed along the Washington and Oregon coasts from Westport in Grays Harbor County south to about Heceta Head in Lane County. In addition, there is a disjunct cluster of populations north of Crescent City in Del Norte County, California. At least 20 separate localities were known for the butterfly in the past. The butterfly and its coastal grassland habitat were probably much more common in the past.

At present, the subspecies is currently well-established at only five sites. They include one in Del Norte County, two in Lane County (Rock Creek-Big Creek and Bray Point), and two in Tillamook County (Cascade Head and Mt. Hebo). A sixth site in Clatsop County (Clatsop Plains) is still extant. In addition, surveys in 1990 confirmed continued presence of a population on the Long Beach Peninsula. A new site was tentatively established on Fairview Mountain in Lane County, Oregon.

The current distribution of the Oregon silverspot butterfly includes three distinct (but in some cases co-occurring) types of grassland habitats -- montane grasslands, marine terrace and coastal headland "salt spray" meadows, and stabilized dunes. The latter two ecosystem types are strongly influenced by proximity to the ocean and are subject to mild temperatures, high rainfall, and persistent fog. In contrast, the montane sites have colder temperatures, significant snow accumulations, less coastal fog, and no salt spray.

Adult emergence starts in July and extends into September. Many males appear several weeks before most females emerge, as is typical of *Spyeria* butterflies. Mating usually takes place in relatively sheltered areas. Adults will often move long distances for nectar or to escape windy and foggy conditions. The Oregon silverspot butterfly differs from related taxa in physiology and slow larval development rates. These differences appear to be specific adaptations to a harsh, coastal environment characterized by fog and cold wind throughout much of the year. A slow caterpillar development rate synchronizes the adult flight season with best coastal weather conditions.

Caterpillars of the Oregon silverspot butterfly feed primarily on western blue violets (*Viola*

adunca), but are known to feed on a few other species of the genus *Viola* as well. Nectar plants most frequently used by the Oregon silverspot adults are members of the aster (Composite) family, including goldenrod (*Solidago canadensis*), dune goldenrod (*Solidago spathulata*), California aster (*Aster chilensis*), pearly everlasting (*Anaphalis margaritacea*), and yarrow (*Achillea millefolium*).

Historically, fire is thought to be the dominant factor that maintained Oregon's coastal grassland communities and their endemic species. Other disturbances such as landslides, small mammal activities, wind throw, and herbivory by invertebrates, small mammals and large native ungulate grazers are thought to have played a secondary role in opening early successional habitat conditions. Severe fires in 1845 and 1910 converted substantial portions of Mt. Hebo from forest to grassland. Since that time fire frequencies on the Oregon coast have been greatly reduced and the extent of coastal grasslands has declined dramatically.

Effects to Oregon silverspot butterflies associated with Partners program projects would most likely result from adverse modification of the species' habitat. In order to minimize disturbance to these butterflies and their habitat, the PDCs listed in Appendix D will be followed.

Vernal Pool Fairy Shrimp

The vernal pool fairy shrimp (*Branchinecta lynchi*) (fairy shrimp) was found for the first time in vernal pool wetlands in the Rogue Valley near Medford and White City, Oregon, in February of 1998 (USFWS 1998b). The fairy shrimp (Family: Brachinectidae) was previously known from numerous sites in California, with the nearest site 80 miles south near Mt. Shasta, California, and was listed as threatened in 1994 (USDI 1994c).

This species of fairy shrimp is restricted to vernal pool wetlands which are shallow depressions that ephemerally retain water in the winter and spring, often into early summer. Vernal pools typically form in flat plains where water percolation is restricted by a clay or hardpan layer so that rainfall is retained for several months of the year (USDI 1994c). These types of plains and their unique hydrology are threatened by development pressures from urban, transportation, agricultural and utility projects. In the Rogue Valley, the vernal pool ecosystems are threatened by urban development, cattle grazing and municipal waste discharge (D. Borgias, pers. comm., 1997).

This fairy shrimp ranges in size from 10.9 to 25.0 mm (0.4 to 1.0 inches), and requires clear or semi-clear water with low total dissolved solids, conductivity, alkalinity, and chloride. Fairy shrimp feed on algae and plankton which is scraped from vegetation within vernal pools, and lay thick-shelled eggs which withstand heat, cold, and dessication (USFWS 1998b). Partner's program projects in vernal pools within and south of the Rogue Valley will survey for the vernal pool fairy shrimp prior to conducting activities. To avoid impacts to the fairy shrimp, Partners program projects in or adjacent to vernal pool habitat within and south of the Rogue Valley will follow the PDCs in Appendix D.

BIRDS

Aleutian Canada Goose

The Aleutian Canada goose (*Branta canadensis leucopareia*) is one of eleven generally recognized sub-species of Canada geese. It is the second smallest species in the Pacific Flyway. The adults are easily distinguished by a white ring around the neck. Other characteristics include: an abrupt forehead, cheek patches generally separated by black feathering on the ventral side of the head, and a narrow border of dark features along the bottom of the neck ring. In 1967, Aleutian Canada geese were listed as endangered (USDI 1967). Fewer than 800 birds remained. Their decline was greatly attributed to the farming of Arctic foxes on all but one of the Aleutian Islands.

The loss of migration and wintering habitat to urban development also contributed to the decline of the Aleutian Canada goose. Chemical pollutants, human disturbance, disease, subsistence hunting by natives on the nesting area, and commercial and sport hunting on the winter grounds contributed further to the reduction of an already endangered bird.

Primarily due to successful control of Arctic fox predation, the status of the Aleutian Canada goose began to improve. The count in the winter of 1986/1987 showed a significant increase in population, from 790 geese in 1975 to 5,000 that winter. In 1990, an estimated 6,000 geese existed. The species was reclassified from endangered to threatened in 1991. The count in the spring of 1996 indicated that there are now more than 19,000 Aleutian Canada geese.

It is now known that the geese winter in and use pastures and grain fields along the coasts of Oregon and northern California and in California's Central Valley. Prior to the northward spring migration, almost the entire population stages near Lake Earl in Crescent City. They arrive in early February and head north in April. Thousands of birds heading north along the southern coast of Oregon stop to graze in the New River pastures on the Coos/Curry county line. At night, the geese roost on the coastal rocks near Bandon. It is presumed that the geese migrate between the Aleutian Islands and their wintering grounds by flying non-stop over the Pacific Ocean, a distance of nearly 2,000 miles.

A unique population of Aleutian Canada geese breeds in the Semidi Islands, southwest of Kodiak Island, and winter only at Nestucca Bay, near Pacific City, Oregon. This population was slowly increasing and reached a peak of 144 birds. In the last few years, it has begun to decline with only 97 birds remaining. Mr. Roy W. Lowe, a wildlife biologist with the Service in Oregon, is conducting research in the Semidi Islands to see if squirrels are preying on goslings and eggs.

No adverse effects to habitat of wintering Aleutian Canada geese are anticipated as a result of Partners program projects. Any marsh restoration projects conducted within the range of the

species could be particularly beneficial to these geese. Disturbance to Aleutian Canada geese could occur from project activities that produce noise above ambient levels. Such disturbance could interfere with resting and foraging behavior, if it caused the birds to flush frequently from their feeding and loafing areas. To minimize disturbance to Aleutian Canada geese the PDCs listed in Appendix D will be followed.

American Peregrine Falcon

The American peregrine falcon is listed as endangered in the United States. The recovery plan was developed by The Pacific Coast American Peregrine Falcon Recovery Team (USFWS 1982).

Peregrine falcons nest on cliffs situated near lacustrine, marine or riparian habitat. They often have a diverse avian prey base associated with riparian habitat (J.E. Pagel, pers. comm., 1996). Peregrine falcons are particularly sensitive to disturbance near the nest cliff during the breeding season, which extends from the winter solstice through the end of August (site specific nesting chronologies vary due to elevation, aspect of cliff, and individual behavioral variations).

Productivity at all peregrine nest sites in Oregon has been hampered by eggshell thinning induced by chronic levels of organochlorines. Due to eggshell thinning, protection of sites from disturbance is important to reduce potential for nest failure caused by human activities.

Silvicultural activities will not be allowed to occur within ¼ mile of any known peregrine nest site; we anticipate no effect to nesting peregrines resulting from habitat modification. Disturbance to peregrines could occur from project activities that produce noise above ambient levels. Such disturbance could be particularly harmful during the nesting season, if it caused incubating adults to flush from the nest, allowing the eggs to cool. To minimize the impacts of disturbance to peregrine falcons the PDCs listed in Appendix D will be followed.

Brown Pelican

A ponderous dark water bird, the brown pelican (*Pelecanus occidentalis)* can reach a bill-to-tail length of 127 cm (50 in) and may have a wing span of near 2 meters (6.5 ft). Adults have much white about the head and neck. Immatures have dark heads and whitish underparts. The species ranges along the southern Atlantic, Pacific, and Gulf coasts of the United States, including the entire coast of Oregon, south to northern Brazil and Chile. Small numbers of immature brown pelicans regularly wander inland in summer, especially in the Southwest. Brown pelicans are listed as endangered (USDI 1970).

Brown pelicans occupy salt bays, beaches, and ocean, generally preferring shallow waters immediately along the coast, but sometimes seen well out to sea. The species nests on islands, which may be either bare and rocky or covered with mangroves or other trees. Strays may appear

on freshwater lakes inland.

The diet consists almost entirely of fish. Types of fish known to be important in some areas include menhaden, smelt, anchovies. Some crustaceans may also be taken. The specie's feeding behavior is spectacular, diving from as high as 18.3 m (60 ft) above water, plunging into water headfirst and coming to surface with fish in bill. Typically, pelicans then tilt the bill down to drain water out of the pouch, then toss the head back to swallow. Brown pelicans will become tame, sometimes approaching fishermen for handouts.

Brown pelicans produce one brood per year. Breeding first occurs at age 3 years or older. Brown pelicans nest in colonies, on ground or cliffs, or on low trees such as mangroves. The nest, built by the female with material gathered by male, may be a simple scrape in the soil, a heap of debris with a depression at the top, or a large stick nest in a tree. Brown pelicans lay 2 to 4 eggs. Both sexes incubate; hatching occurs in 28 to 30 days. Both parents feed the young. Young may leave ground nests after about 5 weeks and gather in groups, where parents returning from foraging apparently can apparently recognize their own offspring. Young may remain in tree nests longer (perhaps up to 9 weeks) before clambering about in the branches. Age at first flight varies, reportedly 9 to 12 weeks or more. Adults continue to feed the young for some time after they leave the nesting colony.

Brown pelicans declined drastically in mid-20th century, as pesticides caused eggshell thinning and failure of breeding. After banning of DDT, the species made a strong recovery; it is now common and increasing on southeast and west coasts.

As stated in Appendix D for the brown pelican, coastal habitats will not be adversely impacted by restoration activities under any of the Partners program project categories, and only native, non-invasive plant species will be used to revegetate disturbed coastal project sites. Therefore, no effect to brown pelicans from habitat modification is anticipated, in association with the Partners program.

Disturbance to brown pelicans in their foraging or loafing areas could occur from project activities that produce noise above ambient levels, or otherwise flush the birds, thus interfering with loafing or foraging behavior. To minimize disturbance to brown pelicans, the PDCs listed in Appendix D will be followed.

Marbled Murrelet

The marbled murrelet (*Brachyramphus marmoratus*) is a small diving seabird in the family Alcidae. Breeding adults have sooty brown upper plumage with dark bars and light, mottled brown underparts. In winter, adult plumage is brownish-gray above, with a white throat and nape, and white scapulars (shoulder patches). Male and female plumage is identical.

The following information has been extracted from the Marbled Murrelet Recovery Plan

(USFWS 1997d). Marbled murrelets have a life history strategy unique among seabirds. Although they feed on fish and invertebrates primarily in nearshore marine waters, they nest inland as far as 52 miles inland from the marine environment, on large limbs of mature conifers. While they are not colonial nesters, these birds are frequently observed in groups of three or more. Detailed accounts of the taxonomy, ecology, and reproductive characteristics of the murrelet are found in the final rule designating the species as threatened (USDI 1992), the final rule designating critical habitat for the species (USDI 1996), and the Service's biological opinion for Alternative 9 of the Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl (FSEIS) (USFWS 1994).

The Forest Service has published the *Ecology and Conservation of the Marbled Murrelet* (Ralph *et al*. 1995), a peer-reviewed, comprehensive summary of the status of the species. This document makes several key points regarding the status of the murrelet. Population trends are clearly downward. Ralph *et al*. (1995) and the Marbled Murrelet Recovery Team believe that possible reasons for the decline include the species' dependence for nesting on older forests that are now scarce and heavily fragmented, its low reproductive rate, and adult mortality due to predation, capture in gill nets, and encounters with oil spills. The amount and distribution of the remaining suitable [nesting] habitat is considered to be the most important determinant of the long-term population trend; further loss may severely hamper the stabilization and recovery of the species.

Most population estimates for murrelets have been conducted using at-sea surveys. Population estimates for the murrelet in Oregon vary substantially. Ralph *et al*. (1995) summarized some of the reasons for variability in population estimates among researchers, including differences in methodology, assumptions, spatial coverage, and survey and model errors. Nevertheless, both Ralph *et al*. (1995) and the Marbled Murrelet Recovery Team have concluded that the listed population appears to be in a long-term downward trend.

Murrelets have approximately 979 known occupied sites within Washington, Oregon, and California (S. Holzman, pers. comm. 1996). The total number of acres of suitable habitat in these three states is unknown. Currently, suitable habitat for the murrelet is estimated at 2,561,500 acres on Federal lands in the listed range of this species (Ralph *et al*.1995).

The entire Coast Range Province supports approximately 400,000 acres of suitable murrelet habitat (based on suitable spotted owl habitat). Approximately 591 known murrelet sites occur within this province, of which roughly 418 (71 percent) are on Federal land (S. Holzman, pers. comm. 1995).

The FEMAT (USDA *et al*. 1993) identified two zones of murrelet habitat based on observed use and expected occupancy. In Oregon, Zone 1 extends 0-35 miles inland from the marine environment. The majority of murrelet occupied sites and sightings occur in this zone. Zone 2 encompasses areas inland from the eastern boundary of Zone 1 and is typified by relatively low

numbers of murrelet sightings, which is partially a function of fewer inventories (USDA *et al*. 1993). The U. S. Forest Service and the Bureau of Land Management have surveyed to protocol 4.2 percent of the suitable murrelet habitat throughout Zones 1 and 2.

No silvicultural activities associated with the Partners program will occur in marbled murrelet suitable or critical habitat. Therefore, we anticipate no effect to marbled murrelets from habitat modification. Disturbance to marbled murrelets could occur from project activities that produce noise above ambient levels. Such disturbance could be particularly harmful during the nesting season, if it caused incubating adults to flush from the nest, allowing the eggs to cool. To minimize the impacts of disturbance to murrelets the PDCs listed in Appendix D will be followed.

Northern Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) is listed as threatened in Oregon. Its present status is a result of destruction of habitat, illegal harassment and disturbance, shooting, electrocution, poisoning, a declining food base, and environmental contaminants. Currently the primary threats to bald eagles are habitat degradation and environmental contaminants. Statewide goals set by the Pacific Bald Eagle Recovery Plan (USFWS 1986) have been met.

In Oregon and Washington, bald eagles typically nest in multi-layered, coniferous stands with old-growth trees located within one mile of lacustrine, large riverine or marine habitat. Availability of suitable trees for nesting and perching is necessary to maintain bald eagle site fidelity and populations. Perch trees are also needed by eagles for hunting and resting. These trees typically provide and unobstructed view of the surrounding area and are in proximity to feeding areas.

Oregon and Washington support approximately 25 percent of the wintering bald eagles in the conterminous United States. Wintering sites are typically in the vicinity of concentrated food sources such as anadromous fish runs, high concentrations of waterfowl or mammalian carrion. Winter roost sites provide protection from inclement weather conditions and are characterized by more favorable microclimate conditions.

Silvicultural activities will not be allowed to occur within ½ mile of any known eagle nest site. Therefore, we anticipate no effect to nesting bald eagles from habitat modification.

Disturbance to eagles could occur from project activities that produce noise above ambient levels. Such disturbance could be particularly harmful during the nesting season, if it caused incubating adults to flush from the nest, allowing the eggs to cool. To minimize the impacts of disturbance to bald eagles the PDCs listed in Appendix D will be followed.

Northern Spotted Owl

The northern spotted owl (*Strix occidentalis caurina*) (spotted owl) breeds in forest communities of the Pacific Northwest. The spotted owl is distinguished by round to elliptical white spots on its chocolate brown body feathers, white bars on the tail, and dark eyes surrounded by tawny facial disks. This subspecies ranges from southern British Columbia, south to Marin County, California.

Most northern spotted owl nest sites observed on public land have been located in old-growth or mature forests (Forsman *et al*. 1984). Spotted owls do not build their own nests; they depend upon suitable naturally occurring nest sites available in older-aged forests, such as broken-top trees and cavities. Less frequently, they will also nest in abandoned squirrel or raptor nests or on platforms formed by mistletoe brooms or debris accumulations. Spotted owls may forage and roost in younger age forest communities. A detailed account of the taxonomy, ecology and reproductive characteristics of the spotted owl is found in the Fish and Wildlife Service Status Reviews (USFWS 1987, 1990b); the 1989 Status Review Supplement (USFWS 1989b); the ISC Report (Thomas *et al*. 1990); and the final rule designating the spotted owl as a threatened species (USDI 1990).

There are approximately 5,600 pairs of spotted owls and resident singles (activity centers) and 8.1 million acres of "suitable" habitat (older age forests) currently estimated across the range of the species (S. Holzman, pers. comm., 1996). Recent demographic studies suggest that the meta-population is declining (Burnham *et al*. 1994, Lande 1988); however, the Service anticipates that implementation of the Forest Plan will provide for long-term conservation of the species.

No silvicultural activities associated with the Partners program will occur in spotted owl suitable or critical habitat. Therefore, we anticipate no effect to spotted owls from habitat modification. Disturbance to spotted owls could occur from project activities that produce noise above ambient levels. Such disturbance could be particularly harmful during the nesting season, if it caused incubating adults to flush from the nest, allowing the eggs to cool. To minimize the impacts of disturbance to spotted owls the PDCs listed in Appendix D will be followed.

Western Snowy Plover--Pacific Coast Population

The western snowy plover (*Charadrius alexandrinus nivosus*), one of twelve subspecies of the snowy plover, is a small, pale colored shorebird with dark patches on either side of the upper breast. For a complete discussion of the ecology and life history of this subspecies, see the final rule listing the coastal population of the western snowy plover as a threatened species (USDI 1993d). The information below is extracted from that document.

Western snowy plovers in the Pacific Coast population breed in loose colonies primarily on coastal beaches from southern Washington to southern Baja California, Mexico. Preferred coastal habitats for nesting include sand spits, dune-backed beaches, unvegetated beach strands,

open areas around estuaries, and beaches at river mouths. Other less common nesting habitats include salt pans, coastal dredged spoil disposal sites, dry salt ponds, and salt pond levees and islands.

Based on the most recent surveys, a total of 28 snowy plover breeding sites currently occur on the Pacific Coast. Six of these sites occur in Oregon, with 3 sites (Bayocean Spit, North Spit Coos Bay and spoils, and Bandon State Park-Floras Lake) supporting 81 percent of the total coastal nesting population. From 43 to 81 plovers wintered on the Oregon coast between 1982-1990 (ODFW1996). The majority of birds, however, winter south of Bodega Bay, California.

Historic records indicate that nesting western snowy plovers were once more widely distributed in coastal California, Oregon, and Washington than they are currently. In Oregon, snowy plovers historically nested at 29 locations on the coast (C. Bruce, pers. comm., 1991). In 1990, only 6 nesting colonies remained, representing a 79 percent decline in active breeding sites.

In addition to loss of nesting sites, the coastal plover breeding population itself has declined significantly. Breeding season surveys along the Oregon coast from 1981 to 1992 show that the number of adult snowy plovers has declined at an average annual rate of about 7 percent (ODFW 1996). The number of adults and young declined from a high of 142 adults in 1978 to a low of 30 adults in 1992, but have since rebounded to 72 in 1995 (ODFW 1996). A number of habitat enhancement projects and conservation measures have been implemented to increase chick survival and minimize human disturbance. In 1996, plover numbers had increased to an estimated 132-137 adults in Oregon (Estelle *et al*. 1997).

The breeding season of the coastal population of the western snowy plover extends from mid-March through mid-September. Nest initiation and egg laying occurs from mid-March through mid-July (Wilson 1980, Warriner *et al*. 1986). The usual clutch size is three eggs. Incubation averages 27 days (Warriner *et al*. 1986). Both sexes incubate the eggs.

Plover chicks are precocial, leaving the nest within hours after hatching to search for food. Fledging (reaching flying age) requires an average of 31 days (Warriner *et al*. 1986). Broods rarely remain in the nesting territory until fledging (Warriner *et al*. 1986).

Page *et al*. (1977) estimated that snowy plovers must fledge 0.8 young per nest to maintain a stable population. Reproductive success falls far short of this threshold at many nesting sites (Page 1990). Fledging success was 34 percent in Oregon in 1996 (Estelle *et al*. 1997).

To avoid or minimize the impacts of Partners program projects on western snowy plover habitat or the potential for disturbance that could cause birds to flush, the PDCs listed in Appendix D will be followed.

MAMMALS

Columbian White-Tailed Deer

Accompanying the demise of the riverine woodland habitat along the Columbia River has been the decline of the Columbian white-tailed deer (*Odocoileus virginianus leucurus*). This deer is medium-sized, with a coat that is tawny in the summer and bluish-gray in winter. Bucks weigh around 182 kg (400 lb), whereas does do not usually get over 113 kg (250 lb). The Columbian white-tailed has between one and two fawns every season; the young deer exhibiting a reddish-tan coat with small white speckles.

Historically, the Columbian white-tailed deer, one of 38 subspecies of white-tailed deer in the Americas, ranged from the southern end of Puget Sound to the Willamette Valley of Oregon and throughout the river valleys west of the Cascade Mountains. Following European settlement, conversion of land to agriculture forced the deer into small vestiges of habitat where they are found today. Logging, vehicular fatalities, poaching, and flooding events also have contributed to the decline of these deer which is listed as endangered (USDI 1967). Today, only two populations exist, one near Roseburg, Oregon, and another on a few small islands and in isolated areas of the lower Columbia River, near Cathlamet, Washington.

Efforts to save the Columbian white-tailed deer from extinction began in 1972, when the Service established the 4,800-acre Julia Butler Hansen Refuge for the Columbian White-Tailed Deer near Cathlamet, Washington. Total numbers of the deer in the lower Columbia River population have increased in recent years. However, the flood of 1996 dealt these deer a setback, possibly eliminating up to half of this population (USFWS 1996). Based on aerial surveys, biologists estimated a post-flood population of 60 deer on the Refuge mainland unit and 100 deer on 2,000-acre Tenasillahe Island in the Columbia River. Before the onset of winter and the February 1996 flooding, deer populations were estimated at 115 to 120 on the mainland and more than 200 on the Tenasillahe Island. Fortunately, flooding of the Julia Butler Hansen Refuge does not appear to have had a major effect on vegetation in the area. Bottomland pastures on the refuge regularly flood during winter, and the woody shrubs on which the deer browse were not killed by the flood.

A separate population of Columbian white-tailed deer, estimated at 5,000 animals, is found along the Umpqua River in Douglas County, Oregon, near Roseburg.

No Partners program projects will result in adverse habitat modification impacts to Columbian white-tailed deer. Therefore, no effects to this species from adverse habitat modification are anticipated in association with the Partners program. Any marsh restoration projects conducted within the range of the species could be particularly beneficial to this deer. Disturbance or take of Columbian white-tailed deer could result in association with Partners program projects. For all current and future projects funded or partially funded by the Partners program in western Oregon, the PDCs listed in Appendix D will be followed.

North American Lynx

The North American Lynx (*Lynx canadensis*) (lynx) is associated with boreal forests in the higher elevations (4000 ft or greater) of the Cascade Mountain Range, historically as far south as Klamath County and through Eastern Oregon (USDA 1994; Oregon Natural Heritage Program, in litt. 1988). Lynx habitat is typically composed of young, dense forests for foraging, and late-successional forests (with down logs) for denning and cover. Intermediate stage forests are used for travel and possibly foraging. The main prey item is the snowshoe hare, although the lynx is somewhat opportunistic and does eat other small mammals and birds (USDA 1994). As a forest-dependent species, alterations to lynx habitat pose the greatest threat to its survival. Of greatest concern is (1) the heavy thinning of dense young forest stands, which adversely affects prey populations, and (2) the removal of late-successional forests, which removes cover and denning opportunities (WDW 1993). The lynx was considered extirpated from Oregon (WDW 1993), although there have been several sightings in eastern Oregon since 1991 (C. Lee, pers. comm.). The lynx has always been rare in Oregon historically, and is considered a candidate species. The lynx is a short-tailed cat, larger than the bobcat with relatively long legs. The coat is reddish to gray-brown in the summer and a mix of gray-brown with buff or pale brown fur on the back and grayish- or buff-white on the underside, legs, and feet in the winter (USDA 1994).

Any Partners program projects that take place in lynx habitat are expected to either not impact or benefit the species. No short term negative impacts are expected. In order to avoid impacts to the lynx, the PDCs listed in Appendix D will be followed.